AN EPIDEMIOLOGICAL APPROACH TO ROAD CRASHES AND INJURIES IN QUEBEC

NATURE, SEVERITY, DIRECT COSTS, DATA QUALITY AND RECORD LINKAGE

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AN EPIDEMIOLOGICAL APPROACH TO ROAD CRASHES AND INJURIES IN QUEBEC: NATURE, SEVERITY, DATA QUALITY AND RECORD LINKAGE

by*

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FOREWORD

This is a revised translation of a technical report entitled Mortalité et morbidité dues aux accidents de la circulation routière. Projet pilote. Etude des victimes ayant reçu des soins médicaux suite à un accident de la route, Québec 1974.

Since this pilot study was first published in the form of a report in June 1978 at the Université de Montréal, the study of road crashes and injuries has continued to develop. Researchers have had access to increasingly plentiful and pertinent data as well as new techniques of analysis. In Québec, for instance, change in automobile insurance regulations has generated a willingness on the part of the Régie de l'Assurance automobile du Québec to promote road safety by making both data and grants available to research.

The authors would also like to mention that certain sections of the report have appeared since 1978, in the form of articles and books.

Claire Laberge-Nadeau
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We would also like to mention Mrs. Francine Dion of the Medical Archives and Mrs. Hélène Julien, laboratory technician, who were both involved in data collection and Mrs. Munirah Amra and Mrs. Monique Touchette, who respectively undertook the translation and transcription of our technical report. Mr. Alastair Risk, a prominent road safety researcher and Louise Valois, research assistant, revised the final copy.

A number of professors at the Université de Montréal acted as consultants during the various stages of the research :

- Jacques Desmarchais, orthopaedist, Faculty of Medicine.
- Urs Maag, statistician, Department of Operational Research and Computer Science.
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- Rolland Pressat, demographer, Department of Demography.
- Céline LeBourdais, research assistant, Department of Social and Preventive Medicine.
- Robert Latour, statistician, Ecole des Hautes Etudes Commerciales.

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We should like to express our sincere gratitude to all the above mentioned people and organizations.

Claire Laberge-Nadeau
Robert Bourbeau
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SUMMARY

This is a working document intended for people interested in the analysis of road crash morbidity. The authors analysed certain problems related to road accident morbidity in Quebec, on the basis of a sample of 1008 people who had recently received medical care (at a physician's office, an out-patient clinic or at the hospital) following injuries sustained in a road accident in 1974. The main objectives of this descriptive retrospective research were the following:

1. analysis of the quality of available statistics on road accidents victims;
2. classification of road accident victims according to the nature and severity of their injuries;
3. consumption of medical and hospital services by road accident victims;
4. analysis of a few characteristics pertaining to the victim/motor vehicle/environment using data from record linkage.

Our results were obtained by comparing police reports with records from the hospitals (AH-101) and the physicians (Quebec Health Insurance Board Q.H.I.B.) concerning the victims studied. This information had already been filed at the Third Party Service of the Q.H.I.B. The quality of statistics for road accident victims in Quebec proves to be reasonably good when our results are compared with those from other countries in which similar studies were carried out. In our sample, all deaths had been reported by the police, but only 7 out of 22 victims were recorded as being deceased. For in-patient victims, 72.6% were correctly reported and 3.4% were not reported by the police. As for the out-patients, 53% appeared on the records and 24% were omitted.

Using these results, we estimate that in 1974, the number of road accident victims was between 70,093 and 79,600 as opposed to

55,961 officially reported victims. Two studies, one in England, the other in Sweden, observed under-estimations higher than those found by us. Even if the quality of statistics in Québec is rather good, the under-estimation of road accident victims is still 22%.

We established an injury profile (nature and severity) for each category of road users. By using the index of Severity ISS (Injury Severity Score) it was found that in-patient victims were injured over three times more severely than out-patient victims. This statement corroborates the logic of a relatively simple classification made by the police of severe or benign injuries according to whether they are hospitalized or out-patient. Pedestrians represent the most severely injured category of road users. As for the nature of injuries, fractures are most common and the extremities are more often wounded than any other body region.

We were able to observe a positive correlation between the ISS index of severity, the total treatment period, and with the length of stay in hospital: this confirms the relevance of the ISS index to injury severity particularly for those victims with multiple traumas.

Finally, we estimated the direct cost of medical and hospital services at $2,379 on average, for each hospitalized victim; for an out-patient the mean costs are at $117.

The dominant characteristics of road crashes were studied by dealing with the injured per category of road users. Moreover, we applied a method of multifactorial analysis to the analysis of our data: the factorial analysis of "correspondences" developed by Benzecri. In order to eliminate the constraint forcing us to make a priori choices on the relationships between different variables, the

Benzecri method was chosen so we could obtain the structural facts contained in our data. Several interesting results showed unexpected but plausible factorial associations that may be a guide to subsequent data analysis. However, within the framework of this study, we do not want to push the analysis any further because of the limits imposed on interpretation by a sample.

The authors see this descriptive epidemiologic analysis as a pilot study because emphasis was laid on the first of the four stated objectives: testing the quality of the data in focussing on morbidity in road crashes. The authors were aware of several limitations in this research:

1. The source of data, collected for administrative purposes, is not representative of all road crash injuries in Quebec: excluded are the on-site deaths and those among the injured who are involved in a crash where no claims could be received as, for example, a collision with a fixed object.
2. Rules of ethic, of confidentiality, carefully elaborated with government personnel, also limited the scope of this study.
3. Secondary data itself always implies limitations in research.

However the authors felt the matching of different and unique sources of documents would help describe the real situation behind the factors reported because of data integration. The process has led to original findings, which are presented in detail in this working document.

The authors hope the readers will consider this study as a pilot in a broader sense: demonstrating that governmental record linkage in studies of morbidity or other aspects of road crashes is feasible and that large samples can be obtained with relatively small budgets.

They also hope this study will open up new ways of exploring an important public health problem.

Claire Laberge-Nadeau
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ABSTRACT

We have analysed a sample of 1008 persons injured in road accidents in the Province of Quebec in the year 1974 in order to explore the accuracy of road accident statistics and to obtain a classification of victims by severity of injuries. We have compared police and hospital reports for our victims, all these informations being gathered in the records of the Third Party Liability Service of the Quebec Health Insurance Board. All fatal cases were notified by police but only 7 of the 22 deaths were correctly notified. For the in-patients, 72.6% were correctly notified and 3.4% were not reported by the police. Only 53.5% of the out-patients were properly notified and 24.4% were not reported by the police.

Using these results, we produced corrected figures for provincial transport statistics which appeared to underestimate the number of victims by 22%. From the data obtained from the Department of Social Affairs, we have estimated that the number of road victims lies between 70,093 and 79,600.

We then computed the Injury Severity Score (I.S.S.) of each victim and found that in-patients were more than three times more injured than out-patients. Pedestrians appeared to be the type of road user with the greatest ISS; occupants of cars ranked second followed by the motorcyclists and the cyclists. Fractures were the most common injury and the extremities were the region most frequently injured.

A strong positive relation was found between the ISS and the period of treatment and the length of stay in hospital confirming the relevance of the ISS for summarizing injury severity, especially in patients with multiple trauma. Finally costs of medical services were estimated for our average in-patient and out-patient.

ROAD INJURIES IN QUEBEC (1974): NATURE, SEVERITY AND DIRECT COSTS

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I INTRODUCTION

INTRODUCTION

For a number of years now, the injuries resulting from road accidents have become a major subject of concern. The rapid increase in the number of motor vehicles on the road was followed by a considerable rise in the rate of road accidents in general and also in accidents causing bodily injuries to different types of road users.

The study of morbidity (injuries and injured) is less common than that pertaining to road accident mortality largely because it is more difficult and more costly to obtain reliable information on this subject.

However, the large number of road accident victims, and their increase over time, require special attention in order to assess what the number and severity of injuries represent. In fact, the number of deaths per 100,000 members of the population in Canada has increased from 18.4 in 1960 to 27.9 in 1974, and the number of injured per 100,000 persons from 504.6 to 1,013 in 1973, which is an increase of 100% in the percentage of injured over a period of 14 years. Moreover, road accident victims are an indicator of road safety. Statistical studies using larger numbers help to point out regional variations and elucidate certain factors. We wanted to test and develop a valid instrument to study car crash injuries, considering that examining secondary data (i.e. data already collected for administrative purposes) can be both efficient and less costly. This was carried out within the framework of this pilot study in order to define different aspects of an epidemiologic retrospective descriptive analysis.

In our research, several fields of study come into play: medicine, surgery, epidemiology, demography, statistics, data-processing, and engineering. It must be stressed that the use of a discipline such as demography is still unusual. However, it was valuable for several reasons:

a) It complements epidemiology and its methods are often used in epidemiology;

b) it often tends to analyse events from secondary data which so many other fields of study reject.

In our pilot project we wanted to concentrate our efforts on the injured victims since we knew that there were several sources of information available on road accidents and that the Third Party Liability Service of the Q.H.I.B., in particular, was developing a reinforced file of record linkage on road accident injury victims. We laid emphasis on the study of the quality of governmental statistics. To our knowledge, no systematic study has yet been published on the quality of statistics on accidents reported in Quebec or in Canada, although from year to year, there is a trend to improve them.

Our concerns with these problems formed the basis of our research, and guided us in the choice of the following objectives:

a) To evaluate the quality of statistics concerning road accident victims in Quebec;

b) to establish the profile of injuries (nature and severity) sustained by different categories of road users;

c) to estimate the consumption of medical and hospital services attributable to road accident victims;

d) to establish the relationship between the circumstances of a road crash and the injuries sustained by the persons involved.

The present report describes the methodology used to meet these objectives (Part II) and presents the results of the analysis and dicussion per research objective (Part III); the conclusion (Part IV) paves the way for a more advanced analysis of our data and the possibilities of further research studies.

II METHODOLOGY

1. STAGES OF THE RESEARCH PROCESS

The research carried out between September 1976 and September 1977 comprised several stages which will now be described. These stages were preceded by a number of essential phases and steps, some of them belonging to methodology, others to administrative procedures particularly delicate when dealing with governmental records.

These preliminary stages mostly involved choosing data sources for the mortality and morbidity study of road accidents and obtaining authorization to use these data.

September to December 1975

This period was devoted to an examination of the data available in the field of road accidents in Canada and particularly in Quebec. We carried out a review of the literature concerning road accidents. This phase allowed us to make a balance sheet of the main research methods and to show the important factors capable of influencing the frequency and severity of road accidents.

During this period approaches were made to several federal ministries (Transport, Justice, Health and Welfare) and provincial departments (Transport, Quebec Social Affairs) and other organizations interested in problems associated with road accidents: the Canada Safety Council, the Traffic Injury Research Foundation of Canada'(TIRF) and at the Université de Montréal, the Centre de recherche sur les transports (C.R.T.) and the Ecole polytechnique, which operates a research team for the in-depth investigation of accidents.

January 1976 to May 1976

During this period we explored mainly the possibility of exploiting data from the Third Party Liability Service of the Quebec

Health Insurance Board. This resulted in several meetings with the Q.H.I.B. officials, in order to explain the nature of our research and to obtain authorization for using data from the Third Party.

Concurrently, we gathered together a number of research workers from several departments (mechanical engineering, statistics, data processing, demography, orthopaedics) in order to form a research group that might cover the multiple facets of the phenomenon of road accidents.

Finally, an analysis was made of published Canadian and provincial statistical data and we edited a descriptive analytic study of the mortality and morbidity due to road crashes in Canada and in each province from 1960 to 1974. (See Laberge-Nadeau, Claire 1976).

June to August 1976

Having received permission to use the Q.H.I.B. data, we obtained a copy of 100 Third Party accident files for the year 1974 in order to make a pre-test on the method of gathering data from the file, the choice and measure of variables and the type of data analysis to be made.

We then submitted a research proposal, within the framework of a Health Research Program grant, to the Ministry of National Health and Welfare. The proposal was accepted. Covering the period from September 1st 1976 to August 31st 1977, it was extended to March 31st 1978.

In August 1976, a meeting with the directors of the Q.H.I.B. allowed us to present the results of the pre-test and to finalize collaboration methods between the Q.H.I.B. and our research group, establishing proper rules of confidentiality.

September-October 1976

These last two months were used for the systematic preparation of data collection: definitive choice of variables, measurement of the variables, drawing up the data processing manual, sampling, staff recruitment and consultation for the computerized processing of data.

November 1976 to February 1977

Data collection was carried out at the Q.H.I.B. in Quebec City and covered a period of 16 weeks. The first step involved training of staff and a test on data accuracy and reliability.

The actual data collection involved:
- firstly, obtaining 1,200 files on road accident victims in 1974 from all the files of the Third Party Liability Service (initial sampling);
- secondly, identification of those files that required completion;
- thirdly, the processing (data specification and coding) of 1,008 files constituting the final sample.

Supervision of the collection was done mainly by the research assistant (a Ph.D. student) and two other persons: a medical archivist and a laboratory technician especially trained for this collection. Tests for accuracy and reliability were carried out in Quebec city by physicians and non-physician research team members.

March-April 1977

We carried out a systematic verification of a percentage of cases from our sample. Then the data was prepared for processing. Two files were prepared: an ACCIDENT file comprising 957 road accident cases in 1974, and a VICTIMS file comprising 1008 victims (associated with 957 accidents) whose files were at the Third Party Liability Service.

We proceeded in such a way that the files could be processed with the help of the SPSS programme (Statistics Package in Social Sciences) available at the Computer Centre of the University of Montreal.

May-June 1977

We began examining files in May 1977 and the analysis of the initial results formed the subject of an article presented to the American Association for Automotive Medicine in September 1977 (see Bourbeau, R., Laberge-Nadeau, C., Proceedings of the AAAM Vancouver Conference, Appendix VI, p. 261).

The analysis focused mainly on the quality of statistics concerning road accident victims (killed and injured) in Quebec. We also presented a classification of road accident victims according to the severity of their injuries as well as results on the consumption of hospital and medical services by road accident victims.

Two American research workers with a wide range of experience in the field of road accidents, Mrs. Suzan P. Baker from Johns Hopkins University and Mr. Leon S. Robertson from the Insurance Institute for Highway Safety, reviewed this part of our work when Mr. Bourbeau met them in Minnesota.

August-December 1977

It was decided that the quality of our data required deeper analysis. Steps were taken to obtain an extension of the grant from the Ministry of National Health and additional financial aid was obtained from Transport Canada in Ottawa and from the University of Montreal (CAFIR).

In October, a presentation was made at the A.Q.T.R. convention.

Crossed table analysis made it possible to draw up the profile of people injured in road accidents per category of road user.

January 1978 to June 1978

A multidimensional analysis using the Benzecri method provided new results. The present report was revised (Bourbeau, Laberge-Nadeau, 1981). A more detailed analysis on pedestrians was consolidated by using our data and other sources which were to form the subject of a Master's thesis (Lebourdais, 1979).

A contract with the Department of Social Affairs made possible the special study on Quebec pedestrian road victims which is the subject of a separate report.

June 1978 to June 1981

The team has carried out other studies in the same field though they do not form part of this specific work. However, we would like to stress that financial support from the All State Foundation of Canada has permitted the translation and compilation of a rewritten English edition of the former technical report published in French in June 1978.

2. PRE-TEST OF 100 FILES FROM THE THIRD PARTY LIABILITY SERVICE

a) Aim of the pre-test

Before undertaking our research on road accident victims from data obtained at the Third Party Liability Service of the Quebec Health Insurance Board, we wanted to be able to better understand the advantages and limits presented by this source of data in terms of our four stated objectives: the variables themselves, the quality and reliability of available information and the analysis we were able to draw from it.

We then obtained a copy of 100 anonymous files on in-patient victims involved in road accident that took place in Quebec between 1972 and 1975. These photocopies were sent to us by the TPLS. Their representativeness was not considered important.

b) The Third Party Liability Service

In accordance with legislation from the Hospital Insurance Act and the Quebec Health Insurance Act, this service recovers health expenses from automobile insurance companies which cover people presummably responsible for accidents in which they were involved; the TPLS collects from the companies the amounts paid by the government by way of hospital and medical services utilized by victims of these accidents.

This service deals with all types of accidents where a third party might be involved. In this respect, road traffic accidents comprise an important part of the files dealt with at the TPLS.

c) Components of the TPLS file:

The Third Party Liability Service (TPLS) makes a file for each of the victims for whom a claim is possible. For this service, it is essential to collect all the data necessary to define "legal" responsibility for the accident, and the amount of compensation the Service wishes to obtain from the person at fault.

Thus, in the case of a road accident victim, the file will usually contain the accident report (filled in by the police) in order to determine the liability of one of the parties involved. Then, in order to evaluate the costs paid by the government, the file collects the hospital records in which are written up the costs related to hospital services as well as a case history of medical services. To this data is added a questionnaire from the TPLS, completed by the victim or his family. This adds data on the circumstances of the accident as well as on the medical treatment received by the victim.

The files described above pave the way for an interesting longitudinal research study on road accident victims since it is possible to follow the victim from the time of the original event (accident) to the end of his treatment period.

Hence the pre-test was meant to help define the advantages and the limits of using this source of information. Moreover, it involved checking the quality of the recorded variables and evaluating the time needed for collecting information essential to the research.

d) Advantages of using TPLS files

The first advantage of using these files is the possibility of matching data on the accident and its consequences. In fact, at the time of our study, it was impossible to achieve a computerized pairing of data relative to the same victim (accident report, hospital record, and a case history of medical care). A large part of this pairing of information, which had to be done manually, had already been achieved by using files from the TPLS. Moreover, it was relatively easy to complete the files requiring additional data, given that we were able to benefit from the system used at the Third Party Liability Service. This advantage shows up in appreciable time saving for data collection.

Access to these files ensures greater geographic distribution than that allowed by studies carried out from medical records at certain hospitals. In fact, we obtained representation from all the regions of Quebec in relation to road accidents. This appears to be an important advantage with respect to research on road accident victims in view of the diversity of prevailing situations in each of the regions (type of road, volume of traffic, type of road users).

At the same time, the pre-test helps meet our expectations regarding the possibility of properly identifying the nature of injuries sustained by the victim. As a result, it is at this stage that the pairing of information comes fully into effect, the injuries being identified mainly through the hospital summary record (AH-101) and by the record of medical procedures (individual's history from the Q.H.I.B.) (See Appendix III, p. 179). It often happens that one of the two sources may be lacking or inaccurate with respect to the type of injuries. However, when the two file components are compared, most of the inaccuracies are eliminated and it is possible to make a fairly accurate judgement on the nature of injuries sustained. The validity test on these data, which will be discussed later, provides the supporting evidence on this issue.

Another advantage of the Q.H.I.B. history stems from the fact that each of the victims can be followed from the accident to the end of his medical treatment whether this service has been given at the hospital, the Emergency Department, the OPD or the doctor's private office. (It is the record of medical services paid by the Q.H.I.B. that is the key element - the doctor bills Q.H.I.B. for the cost of each consultation and medical procedure by filling out a standardized form.
It must be emphasized that the physician is more inclined to

give that accurate information since payment for each service rendered depends on this information).

Finally, it should be pointed out that a questionnaire is completed by the victim or his family. This contributes vital information not found on any of the forms in the records. However, the quality of these data is very irregular and must be used with great care.

e) Disadvantages of using TPLS

Use of the TPLS files for the purposes of our research resulted in certain disadvantages, which will now be discussed.

Firstly, it was difficult to identify the entire population of road accident victims from all the files of the TPLS. Thus, the classification of their files did not consider the type of accident (work accident, road accident, other types of accidents) and the year of the accident. All the files are classified together according to an alpha numeric code, the COMPOS (name, date of birth, and sex). This type of classification made it difficult to choose a representative sample of all Quebec road accident injuries during a given year.

The service does not develop a record of each road accident victim; most of the victims are not responsible for the accidents, and have received medical care paid for by the Q.H.I.B. Moreover, not all the non-responsible victims are registered by the TPLS for different reasons that will be dealt with later. This implies that the sample of victims is not representative of all road accident victims in Quebec during a given year. For example, the drivers are under-represented in the TPLS files whereas pedestrians are over-represented. In the same way, in-patient victims are over-represented in relation to out-patients. However, this difficulty may be overcome if it can be proved that the sample victims (type of victim: in-patient, out-patient; category of road user: pedestrians, passengers, drivers) are representative of certain sub-populations of victims.

The pre-test helped us come to grips with the limitations of the available data. On the one hand, the accident report does not contain variables important for research into factors influencing the frequency and severity of road accidents. Thus there are no data on the use of vehicles, the presence of alcohol and the position of motor vehicle passengers. As far as the variables on the accident report are concerned, their quality sometimes leaves much to be desired in terms of the characteristics of drivers and victims (age, driving experience, driving licence) and certain accident characteristics (type of accident, damage to vehicles, road category). However, the presence of other kinds of information often made it possible to fill in the gaps for these data.

At the time of the pre-test, we also realized that the files were not all complete. One or several components essential to our research were missing and would have to be completed before the data collection could begin.

f) Choice of variables

The pre-test on the 100 files of in-patient victims also gave the opportunity for determining which variables would be extracted from the different forms. At this stage, 59 variables were chosen. An initial series of 29 variables concerned the victim for whom the file was made as well as variables related to: identification of the victim (10 variables), hospitalization (15 variables), type and severity of injuries (8 variables), and medical care (6 variables). A second series of variables (30) concerned the accident in which the victim was involved: characteristics of the accident (15 variables), drivers

(5 variables), victims (6 variables), vehicles (4 variables). For details of the variables see Appendix IV, p. 187).

It will be noted that for purposes of our actual study we have added variables related to details on hospitalization and medical treatment. However, all the variables chosen during the pre-test were retained.

g) Data Collection

The pre-test served as a guide while we selected variables for our study from Third Party files. This was particularly the case for variables dealing with the nature and severity of injuries. In fact, this part of the collection was the most tricky because it required a judgement to be made on the nature of the injuries. It was a question of being as accurate as possible in handling available data during interpretation for research purposes.

Collecting the other data posed fewer problems because it involved a process of extraction or copying data present on the forms in the files.

At the time of the pre-test, we estimated the average time required for copying out all the variables from a Third Party file, to be half an hour. On the other hand, we knew that several files would have to be completed at the time of the actual collection. This procedure implied that we would have a two-stage collection. First each file would have to be examined to find out its degree of completion and to find out how to obtain the missing elements. The second stage would be to make the data collection itself on the 100 cases.

This double handling of files combined with research into missing documents meant that the average time devoted to collecting data for each of the files must be evaluated at approximately one hour. This evaluation had to guide several of our future choices with respect to data collection i.e. staff required, size of the sample, duration of the collection.

h) Analysis of the pre-test files

As a preparatory exercise to our study, we performed an analysis of data from 100 pre-test files. (The question which interested us was the type of analysis to be made). It must be pointed out that data were analysed with the aid of the SPSS programme, which allowed for convenient use of the most recent statistical techniques.

We produced a series of results in the form of crossed tabulations, statistical tests (X^2, T Test), and regression analysis. Above all we wanted to consider the possibilities of analysis offered by the type of card-index that we were able to compile from the TPLS files. It seemed essential to envisage the type of data analysis to be carried out before choosing definitely the variables to be collected.

i) Conclusion: Extension of the study

The pre-test has been useful in several ways. It enabled us to become aware of the quality of data and their limits and allowed for better planning of the stages of the entire project: sampling, data collection, verification and analysis. Moreover, in our capacity as the first users of data from the Q.H.I.B. for research on road accidents, we had to ensure that the data, in spite of their limits, constituted a unique source of information on the causes and consequences of the different types of accidents occuring on public roads. The pre-test would seem to confirm our presumptions in this regard.

Finally, we want to draw attention to a question that is in some way a result of the pre-test, that is: extending our study to non-hospitalized victims. At the outset, our study intended to deal exclusively with in-patient victims; in fact, we did not believe it possible to obtain sufficient information for studying victims who do not remain in a given hospital centre. During the pre-test we questioned our choice because the Q.H.I.B. index offered the possibility of following up non-hospitalized victims at the physician's office as well as at the out-patient clinic of a hospital centre.

We saw the possibility of extending our study to a category of victims who are less well-known in spite of being more numerous than the category of in-patient victims. Another original element was added to our study without watering down our original objectives. This allows for a more complete examination of the injured population - which to our knowledge has never been the subject of systematic research in Quebec.

3. DRAWING UP THE SAMPLE OF FILES FROM THE THIRD PARTY LIABILITY SERVICE

Following the results of the pre-test made on 100 files, it was decided to use such data for carrying out our study. We next had to consider the possible alternatives for drawing up a sample of road accident victims.

a) Possible alternative sampling procedures

The first possibility envisaged by us consisted in choosing a sample of accidents from the set of accident reports completed by the police in 1974, since we were looking for a representation of all road accident victims in Quebec. Among the injured identified on each accident report, we tried to find those who had a file at the Third Party Service. This method would allow us to obtain characteristics of victims who had no file at the Third Party Liability Service and also help us understand to what extent the TPS files represent all road accident victims. However, this method did not provide information concerning the level and quality of the victims' records and police reports.

On the other hand, this method posed several practical problems: thus, identifying victims on the police reports is not always sufficient for recovering this victim's file at the Third Party. Hence, identification of the Third Party files could not be done efficiently and accurately.

The other possibility consisted of choosing from files at the Third Party a sample of road accident victims in 1974 representative of the Third Party files.

This sample imposes certain limits because it does not include all types of road accidents. For example, people who die before arrival at the emergency department are not part of this sample. In the same way, victims legally responsible for the accident in which they were involved do not have a file at the Third Party. Thus, the drivers are under-represented in the Third Party files. But we may assume that the nature and severity of injuries sustained by "not-responsible" victims in an accident are no different from those sustained by responsible victims.

On the other hand, the Third Party files are certainly more representative of the population of road accident victims than those compiled exclusively from the medical records of one or several hospitals as can be seen in several relevant publications. A sample from the Third Party Service offers a greater probability of representativeness at the geographic level.

Finally, the cost of data collection from these Third Party files is much lower than that of other types of collection (hospital files, in depth studies).

All these reasons operate in favour of the second possibility which consists in choosing a sample of files from the Third Party Liability Service and representative of TPLS records.

b) The Third Party Files

At the time when our study was initiated, the TPLS had about 40,000 records in its department. These records are in constant use by service staff. The files are divided into two broad categories: the active files (not yet settled) and the closed files. The total number of files at the Third Party can fluctuate. New cases may be added; files closed for a certain period of time are sent to the archives. However, files for all years and for all kinds of accidents involving a third party claim are grouped together.

There are several choices to be made in the light of these 40,000 files: size of the sample, type of file (year and type of accident) and the method used.

c) Size of the sample

Preliminary trials allowed us to establish that each file required on average, one working hour (handling, processing and checking).

To obtain our data within a reasonable period of time (the time limit was fixed at 4 months) the size of the sample was limited to 1000 victims. This number seems satisfactory at the statistical level and allows us to arrive at quite an accurate level of analysis.

d) Type of file

First, we are only interested in road accident victims. The accidents must occur on a public road, and involve at least one motor vehicle.

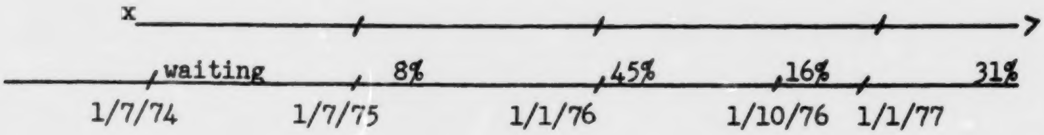
Since the length of treatment of road accident victims can sometimes be quite long, we chose 1974 as our accident year, in order to obtain complete data.

The other choice involves the category of files: active and closed. This choice is of marked importance because we may assume that certain types of cases are more easily settled than others.

Our choice was based on information from the Third Party concerning delays in settlement (or closure) of files. From a sample of 1974 victims the Third Party had set the following average delays respecting closure of files:

12 months	8%
13-24 months	61%
24 months	31%

If we assume that the average accident occurs on July Ist, 1974 and that there is a waiting period of about 6 months before the file is drawn up at the Third Party Service, we may estimate that at the time of our study about 50% of the 1974 files were active and the same percentage held for closed files.



Hence we opted for a sampling derived from 50% of the active files and 50% of the closed files. The type of sample chosen was the cluster type. (See Appendix VII, p. 261 for details).

e) Total population of files and representativeness analysis

Table 1 tabulates the results of our estimates regarding the total number of files accessible at the Third Party and the total number of files relative to 1974 road accident victims. It also offers totals for the files that were examined and those that were retained.

Table 1

Out of the total number of TPLS files, estimation of the number of road accident victims in 1974 (available at the time of our study).

Type of files	Total files			Files	
	According to our estimations	According to TPLS	Road accidents in 1974 (estimated)	Reviewed	sample
Active 1st type*	17,700	-	1958	3245	359
Active 2nd type*	14,072	-	1470	2326	243
Total active	31,772	30,680	3428	5571	602
Closed	14,323	13,927	3288	2604	598
Total	46,095	44,607	6716	8175	1200

* Types 1 and 2 differ only in their location within the Third Party.

Several points emerge from this table: first, our estimates of the total number of files at the Third Party Service seem quite satisfactory. The difference between our estimates based on the sample of 46 095 total records and the TPLS 44 607 records is only 3%, which is quite acceptable.

Another point concerns the estimate of the total population of 1974 road accident victims who have a file at the Third Party. The number (about 7,000) may seem rather low considering that the police reported about 56,000 road accident victims in 1974.

One could ask how many victims should be the subject of a Third Party claim among these 56,000 victims.

To have a file at the Third Party, a road accident victim has to fulfil certain criteria:

- Have received medical or hospital services paid for by Hospital Insurance or the Quebec Health Insurance;
- not be responsible for the accident in which the victim has been involved;
- be registered by the Third Party Service of the Health Insurance Board or by the Hospital Insurance as a possible case for claim.

The first criterion eliminates all victims who die on the site of the accident or before arrival at the hospital (about 80% of road accident deaths: 1500 victims in 1974); and secondly, victims recorded as being injured on the police report, but who do not receive any treatment. However, this group might be balanced out by injured persons not declared by the police and who receive medical treatment all the same.

The second criterion also eliminates a large number of the victims of the population studied by the Third Party. In fact, we may assume, in order to simplify matters, that there is perfect symmetry between victims as far as liability is concerned. Thus, the 56,000 victims in 1974 would be equally distributed between those who are liable and those who are not liable.

Therefore, all victims who are not liable (about 28,000 victims) should be recorded as Third Party cases unless they have been eliminated by the first criterion; among the liable victims, those persons directly responsible have to be eliminated (drivers) as well as those who are directly related (husband, wife, children) to the person who is liable. With the available data it is very difficult to estimate this number.

The second criterion eliminates all victims of accidents in which only one motor vehicle is involved and where only the driver (or a close relative of the driver) is injured, because there is no third party.

Given the above, we estimate that a minimum of 18,00 victims should have a file at the Third Party. Hence it would seem that large numbers of cases are not recorded by the Third Party Service: the population of 1974 road accident victims with a file at the Third Party was estimated at about 7,000.

Several reasons may explain why a victim is not registered. On the one hand, while it is important that he be properly identified in the care system, it often happens that he does not have his Medicare card at the time of care dispensation. On the other hand, it is often difficult either to contact the victim for more details after the accident (wrong address), or to receive a reply to the Third Party questionnaires in certain litigation cases.

So, both for the Q.H.I.B. and for the Hospital Insurance, one has to rely on diagnoses written on the forms (hospitalization HI-101 or the physicians' claim forms) to know whether we are dealing with injuries resulting from an accident where a third party liability can be envisaged. These diagnoses can be deceptive (in 1973 it was found that 14% of the diagnoses associated with road accidents did not represent injuries sustained at the time of a road accident).

We cannot evaluate the available data any further but we wanted to explain the degree of representativeness of the sample drawn up by our team.

f) The final sample

Firstly, we selected a total of 1,200 files for 1974 road accident victims. We filled in an information sheet for each of these cases (Appendix I, p. 169). About 500 of the files were completed at this stage for the purposes of our study. The other files had to be completed either by the accident report, the hospital records or the case history of medical care. Our objective was to complete about 500 out of 700 incomplete files in order to make up a sample of about 1000 victims.

By carrying out this procedure whereby 200 files had to be rejected, we managed not to modify the main characteristics of our initial sample, i.e. case distribution according to type of file (active, closed), type of victims (in-patient, out-patient) and type of accident (car-car, car-pedestrian).

The distribution of rejected files according to the row or box from which they originate, is given in Appendix II (p. 171) of the construction of our sample.

The files rejected because they are incomplete (15% of the initial sample), do not represent a bias. Our sample, therefore, represents the total number of files developed by the Q.H.I.B. and does not represent all the 1974 Quebec road crash victims.

Table 2

Distribution of files from the initial sample, rejected files and files from the final sample, according to the kind of victim (H or NH) and the type of files (A or C).

Type of files		Kind of victims					
		Hospitalized H		Non-hospitalized N-H		Total	
		Number	% *	Number	% *	Number	% *
ACTIVE A	Initial sample	453	75.2 54.1	149	24.8 41.2	602	100.0 50.2
	Rejected	84	84.8 60.9	15	15.2 27.8	99	100.0 51.6
	Final sample	369	73.4 52.7	134	26.6 43.5	503	100.0 49.9
CLOSED C	Initial sample	385	64.4 45.9	213	35.6 58.8	598	100.0 49.8
	Rejected	54	58.1 39.1	39	41.9 72.2	93	100.0 50.1
	Final sample	331	65.5 47.3	174	34.5 56.5	505	100.0 50.1
TOTAL	Initial sample	838	69.8 100.0	362	30.2 100.0	1200	100.0 100.0
	Rejected	138	71.9 100.0	54	28.2 100.0	192	100.0 100.0
	Final sample	700	69.4 100.0	308	30.6 100.0	1008	100.0 100.0

* The first figure indicates the horizontal %.

The second figure indicates the vertical %.

4. IDENTIFYING THE FINAL CHOICE OF VARIABLES

a) Sources of data

Enough information must be collected to give a proper description of the nature and consequences of road accidents. The pre-test helped to guide us in our final choice. The variables chosen draw from the following four components of the individual file, drawn up at the Third Party Liability Service of the Quebec Health Insurance Board.

1) The accident statement completed by the police (accident report): 42 different variables stem from information contained here. These variables deal with the identification of the accident (date, nature, severity, region), the environment (temperature, road surface, speed), the vehicles (type, year, movement), the drivers (age, sex, driving experience) and the victims (sex, age, category of road user).

2) The hospital report (H.I. Form 101): 31 variables are drawn directly from this file component plus variables that deal with the identification of injuries (12 variables) where more than one element is a contributing factor. Variables drawn from the hospital report concern the victim's identification (occupation, marital status, residence), the hospital stay (duration, costs), the medical or surgical treatment and the nature of the injuries.

3) The case history of all the medical services provided by a medical specialist or a physician to an in-patient or an out-patient (medical procedure, date, diagnosis and costs): this data made it possible to follow each patient's progress from the accident to the end of his treatment (in most cases) and provided 17 variables plus 12 others identifying the injuries.

4) The Third Party Service Questionnaire: the information contained here does not actually supply new variables but it often fills in

gaps. It proves useful in identifying the victim as well as providing data relative to the medical treatment. It has the advantage of coming directly from the victim or a relative and of confirming what is retrieved from the other records. Retrieval has to be done manually.

It should be added that other elements of the TPLS file (work sheets used by the Third Party Liability Service) sometimes add information. We made full use of this.

A copy of the file's four essential components is given in Appendix III (p. 179).

Having data from 4 different sources on the same victim had the following advantages: 1) Checking accuracy and reliability of repeated information; 2) completing missing information; 3) reconstructing the accident and its injuries.

b) Description of the variables and card indexes

Two card indexes were made: one entitled ACCIDENT, regrouping the data relative to circumstances of the accident and another entitled VICTIMS, regrouping data relative to consequences of the accident (injuries and medical treatments).

We worked towards an automatic pairing of the card-indexes. The description of the card index as well as the description of each of the variables and the categories used for these variables are presented in Appendix IV (p. 187).

Table 3

Types of variables and sources of information

Type of variable	Sources of information				
	Accident report (1)	Hospital report (2)	Hist.of Med procedure (3)	Questionnaire TPLS (4)	Other information on files (5)
Identification of the accident: environment	X			X	
Vehicles	X			X	
Drivers	X			X	
Victims	X			X	
Characteristics of the victim having a TPLS file	X	X		X	X
Type of injury		X	X	X	
Medical treatment		X	X	X	
Hospital treatment		X	X	X	
Cost of medical and hospital care		X	X		X

5. DATA COLLECTION ON INJURIES

Data on the injuries were obtained from the Third Party Liability Service of the Q.H.I.B. from pairing of three information sources: statement of medical care, hospital report and the questionnaire filled in by the victim or his family. The statement of medical care provides information on medical care given by a physician, the diagnosis, date and costs. The hospital report supplies information on the diagnosis, type of treatment, length of in-patient stay, and the costs incurred. The questionnaire supplies information on medical treatment procedures.

Data on the injuries was collected by three people. The method consisted firstly of identifying, (according to the adapted international classification of diseases (ICDA)) and writing up on a special form (Appendix V, p. 235) the smallest injury unit by comparing the three sources of information. Secondly, it was a question of giving each of these injuries a severity code according to the AIS (Abbreviated Injury Scale) and then interpreting the information collected. Finally, these data had to be compiled in order to give each victim a total severity index for injuries according to the Injury Severity Score (ISS). This process requires a judgment on the application of the AIS rules.

The first cases were analyzed jointly by the three people involved in the data collection, in order to adopt a standard procedure in the study of cases. Then, only the cases at issue were discussed by team members. Finally, all the cases were reviewed by the same person, in order to standardize as far as possible the information collected within the study.

The hospital report (Hospital Insurance Patient Summary) and the statement of medical care define the diagnosis and services rendered by the physician, but do not supply all the detailed information on injuries as would the complete hospital's patient record.

6. RELIABILITY AND VALIDITY TESTS

A) Introduction

The study of injuries sustained by road accident victims may be carried out using different sources of information as starting point. Having recourse to interviews with the victim or his relatives may supply useful information on the individual's lifestyle and experiences.

The validity tests try to measure to what extent an observed situation as described by the data reflects the actual situation, or at least the situation most closely approximating it, namely the patient's hospital record.

The reliability test seeks to establish whether, in the collecting of information, there is bias in the observer, or variation from one observer to another; also whether there are differences between physician codification and non-physician codification.

These two data tests are very important and must precede the data analysis because problems with the information collected could lead to erroneous conclusions.

B) Inter-observer variation: The reliability test

We wanted to check inter-observer variation and also whether medical knowledge could influence the writing up and interpreting of data in terms of injury severity, since this classification implies a judgement by the observer.

a) Method

The time required for the full study of one victim's injuries was between 15 to 20 mins; 21 cases were analysed by six observers. The group was composed of three data collectors and three physicians:

two epidemiologists, and one orthopedic surgeon. Two of them analysed a total of fifty cases. Each of the 6 independently reviewed and scored the cases according to the procedure described above, and 8 different variables were retained, as listed in table 4.

The files examined came from the study's sample of 1,008 victims; no formal sampling method was used.

With this type of variable, where the normal distribution cannot be assumed, non-parametric tests are applicable. Moreover, no test was made of the averages because the series were paired and not drawn from independent samples.

Therefore, we used the Wilcoxon tests when comparing two series and the Friedman tests when comparing more than two series. For 21 cases, a statistical study was made of the three preceding variables among the six persons, between the two groups comprising three physicians and three non-physicians, and within each of the two groups.

b) Results

The results for the 21 cases analysed by the six observers in terms of number of injuries, number of wounded regions, and severity indices AIS and ISS, are presented in table 4.

Table 4

Number of injuries, number of AIS regions, AIS and ISS severity index according to 6 observers (21 cases)

Variables	Observers					
	Physicians			Non-physicians		
	1	2	3	4	5	6
Total number of injuries	49	46	47	50	50	49
Mean number of injuries per victim	2.33	2.19	2.24	2.38	2.38	2.33
Mean AIS per injury	2.02	2.17	2.21	2.02	2.10	2.06
Mean AIS for the worst injury	2.05	2.29	2.33	2.14	2.29	2.24
Total number of AIS regions	30	32	35	33	33	33
Mean number of AIS regions per victim	1.43	1.52	1.67	1.57	1.57	1.57
Mean AIS per AIS region	2.00	2.19	2.14	2.00	2.09	2.06
Mean ISS per victim	7.24	10.10	10.43	7.90	8.62	8.57

The different variables present a few variations among the observers, but it is impossible at first glance to define whether these variations are significant. Non-parametric tests by Wilcoxon and Friedman made it possible to clarify this issue. The results are presented in table 5.

Table 5

Results of Friedman (X^2) and Wilcoxon (T_n) for the different variables ~~(reliability test)~~.

Test	Variables		
	Number of AIS regions	AIS severity of the worst injury	Total severity of ISS injuries
*Between the 6 observers	$X_5^2 = 1.0$	$X_5^2 = 2.5$	$X_5^2 = 7.8$
+Between the two groups: physicians vs non-physicians	$T_9 = 25$	$T_{11} = 32.4$	$T_{17} = 56$
*Within each group: - physicians - non-physicians	$X_2^2 = 1.10$ $X_2^2 = 0.10$	$X_2^2 = 1.68$ $X_2^2 = 0.40$	$X_2^2 = 5.21$ $X_2^2 = 0.18$

*Friedman's test

If $\alpha = 5\%$, X^2 must be > 11.07 to be significant

If $\alpha = 5\%$, X_5^2 must be > 5.99 to be significant

+Wilcoxon's test

With $\alpha = 5\%$, T_9 must be < 6 to be significant

With $\alpha = 5\%$, T_{11} must be < 11 to be significant

With $\alpha = 5\%$, T_{17} must be < 35 to be significant

According to these statistical tests, no significant difference (at 5% threshold) exists between the different groups or observers. The null hypothesis, i.e. there is no appreciable difference between the observers, is therefore retained.

Moreover, we statistically tested for total severity of injuries out of 50 cases, the values attributed by two physicians and the person who reviewed all the files. The differences seem to diminish when the sample is increased; X_2^2 0.07 is obtained whereas the threshold of acceptance (a = 5%) is 5.99.

c) Conclusion

The data of the study appear reliable because the statistical data show no significant differences between observers. Nor does a physician's medical knowledge appear to be necessary for this type of data collection, since there are no great differences between physicians and non-physicians. It should be mentioned that the non-medical people (a medical archivist, a laboratory technician and a demographer) did have a certain amount of medical knowledge. However, they seemed to adhere more strictly to the rules laid down for codification whereas physicians tended to interpret severity according to their clinical judgement rather than according to the established classification rules.

On the other hand, as all the cases were reviewed by the same person, we may expect a certain consistency in the data and a minimum amount of bias.

C) Validity Test

a) Aim

The purpose of the validity test is to check whether the information collected reflects the real situation and whether it is as complete as possible. The medical record at the hospital containing the physicians' and nurses' observations, laboratory tests, X-Rays, and a synthesized summary, is obviously a more complete and accurate record as far as injuries are concerned. By using this source of information, we can expect to obtain more data, especially on head injuries, fractures and minor injuries, than by analysing files from the Third Party Liability Service.

b) Methods

Forty-four of the sample's 1,008 victims were treated at the same teaching hospital in the Metropolitan area. For each of them, the medical record was found, analysed and scored by the person who had reviewed all the cases of the study, but independently of the variables already recorded from STR's records. As with the data collection, each of the injuries reported by the medical record had to be identified and coded. The test was made about two months after the data collection had ended in order to prevent the observer from remembering certain cases.

Once the information had been collected, the data were compared to that from the Third Party Service. In this way, we compared the number of injuries and AIS regions, the AIS severity of injuries and AIS regions, and the index of total ISS severity of injuries.

Three variables that seemed interesting to us in the study of injuries were dealt with statistically: these are the number of AIS regions, the AIS index of severity and the index of total severity of injuries. The non-parametric test by Wilcoxon was used, because of the small number of cases studied. No test was made of the averages because the two series are paired and derived from independent samples.

c) Results

The average and total results calculated from the two sources for certain variables are presented in table 6.

The average results calculated for the two sources seem to confirm the hypothesis proposed at the outset: the medical record identifies a greater number of injuries and AIS regions than the TPLS record linkage. The average AIS severity per injury is higher when derived from the Third Party files, but lower when only the same injuries, as reported by the two sources, are considered. This is explained by the fact that the medical record helps in identifying, in addition, certain minor injuries (AIS=1). Moreover, the medical

Table 6

Number of injuries, number of AIS regions, AIS and ISS severity index, according to 2 sources of information (44 cases)

Variables	Sources	
	Third Party Liability Service	Medical records
Total number of injuries	119	131
Mean number of injuries per victim	2.70	2.98
Mean AIS severity per injury	2.22	2.15
Mean AIS severity for the same injury	2.35	2.40
Mean AIS severity for the worst injury	2.77	2.89
Total number of AIS regions	74	81
Mean number of AIS regions per victim	1.68	1.84
Mean AIS severity per AIS region	2.38	2.32
Mean AIS severity for the same AIS region	2.55	2.65
Total ISS severity average per victim	10.86	11.55

record more accurately identifies certain severe injuries (mainly the fractures and head injuries); thus increasing the average AIS severity of the most severe injury.

The Wilcoxon test, calculated from the two series of results, suggests that there is no significant difference between the two sources with respect to the AIS regions, and the AIS severity index for the most severe injury. With respect to the index of total severity of ISS injuries, the result of the test (T=23) allows us to refute the null hypothesis and thus confirm that there is a statistically significant difference between the two sources of information (table 7).

The significant difference between data from the medical record and data from the Third Party is explained by the fact that the AIS index is a function both of the number of AIS regions and of the AIS severity index for these regions.

Table 7

Wilcoxon tests results for different variables (validity test)

Tests	Variables		
	Number of AIS regions	AIS severity for the worst injury	Total severity of ISS injuries
Medical record vs STR (Wilcoxon)	$T_{12} = 18$	$T_7 = 4$	$T_{19} = 23$*
Validity threshold	$T_{12} < 14$	$T_7 < 2$	$T_{19} < 32$

* Valid to 1%.

Although the gap between information sources for these last two indices is not significant, their cumulative effect produces a significant difference with respect to the total severity of ISS injuries. In fact, table 6 shows that the contribution made by the medical record resulted in an increase of the number of injuries identified as well as the number of AIS regions but that, most often, these injuries were of minor severity (AIS=1).

We realize in fact that the average AIS severity per injury is lower when the medical record constitutes the source of information. On the other hand, for the same injury the medical record produces a higher AIS average. The same phenomenon is observed for the AIS regions.

Thus, the major consequence of the medical record is to add an AIS body region to the calculation of the index of total severity of injuries and this leads to a significant difference between the ISS according to the two sources of information. We do not know if the difference would be maintained with a larger sample. However, it must be emphasized that the ISS is the same for 25 out of 44 cases tested whatever the source of information. In 10 cases, the ISS calculated from the medical record is higher than, and in 3 cases lower than, that derived from the Third Party file.

d) Conclusion

The data in our study seem to underestimate to some extent the index of total severity of the injuries. The index may not be the best indicator of data quality because it is a result of the number and severity of injuries. The medical record seems more complete and representative of reality. However, in order to use it one has to return to the hospital and, consequently, the sample represents a local population. In this respect, the Third Party Service allows for a faster selection of a more representative sample of all road accident victims in Quebec. The ideal solution would undoubtedly be to match the police report with the hospital records, but this again presents problems at the level of time, travelling costs and number of victims covered. While it allows for a relatively reliable classification, the Third Party data makes it possible to study accident characteristics, to ensure a greater representativeness of road accident victims in Quebec, and to collect data in a relatively short time at a lower cost. Moreover, as we are dealing with permanent secondary data, the use of this data makes it possible to envisage regular examinations of the development of road safety with a new instrument.

7. DATA PROCESSING AND METHODS OF ANALYSIS

a) Verifying the coding

The form used for data collection was designed so the variables could be coded directly. A verification of the coding process was carried out before the data punching stage. In this way, all the files were reviewed in order to identify coding errors or discrepancies.

b) Card punching and data verification

The data was subsequently placed on punched cards. Verification helped minimize punching errors and produce a magnetic tape as free from errors as possible.

c) Drawing up card indexes

Two computerized card indexes were created: the ACCIDENT card index and the VICTIM card index. The first contained 957 cases (road accidents) to which were linked the 1,008 victims making up the second index. Each card index could be processed separately or the two indexes could be matched. At the same time, it must be explained that the "VICTIMS" index contained two sub-indices used for distinguishing the in-patient victims from the out-patient victims.

Details on index structure are given in Appendix IV (p. 187).

d) Methods of data analysis

The ACCIDENT and VICTIM card indexes were structured so they could be processed by the SPSS Programme (Statistical Package in Social Sciences). This program permits one to do a large number of statistical analyses, from the simplest to the most complex.

In this way, a series of frequency tables were produced as well as crossed tabulations, in order to determine the distribution of all the accidents or victims according to the different variables. The idea was to come up with general characteristics for the samples of accidents and victims. These results will be discussed in the next section.

In addition, several analytic techniques were used to identify "statistically significant" differences for certain variables concerning the accidents or victims as a whole or the sub-groups (category of road users, type of accident). Among the techniques used, we can mention regression analysis, variance analysis, the Chi-square test (X^2) and the T test. The results of these analyses are also presented in the next section.

III RESULTS AND DISCUSSION IN TERMS OF RESEARCH OBJECTIVES

OBJECTIVE I:

The quality of statistics on road accident victims in Quebec

Objective I: The quality of statistics on road accident victims in Quebec.

1. SAMPLE REPRESENTATION

The 1,008 victims of our sample are taken from 957 different accidents. These 957 accidents produced a total of 1957 victims of whom 1059 (54.1%) had a file at the Third Party; 1,008 (51.5%) constituted our final sample.

Figure 1

Composition of the sample

957 casualty accidents
- 72 fatal accidents
- 885 non fatal accidents

All victims	The sample victims
89 deaths	22 deaths
856 injured in-patients	683 injured in-patients
783 injured treated as out-patients	290 injured treated as out-patients
41 injured without treatment	13 injured treated in the physician's office
99 injured not identified by the police	
89 undefined injured	
1957 victims	1008 victims

The sample of accidents comprises 7.4% of fatal accidents and 92.6% of non-fatal accidents. For the whole of Quebec in 1974, 39,132 accidents were divided into 1555 fatal accidents (4%) and 37,577 bodily and non-fatal accidents (96%). Therefore, there is a slight over-representation of fatal accidents in our sample.

However, as all the victims involved in the same accident are not all in our sample, we must examine the distribution of victims in the sample closely (table 8).

Table 8

Distribution of victims according to their status. Sample and total Quebec figures for 1974.*

Status of victims	Sample		Quebec 1974	
	Number	%	Number	%
Dead on arrival at hospital	5	0.1	1505	2.7
Dead after hospitalization**	17	1.6	377	0.7
Injured - hospitalized	683	67.8	13942	24.9
Injured - non-hospitalized	303	30.5	36065	64.4
Injured - untreated unspecified	-	-	4072	7.3
TOTAL	1008	100.0	55961	100.0

* Source: Ministère des Transports (Québec), Statistiques d'accidents de véhicules automobiles au Québec, 1974, Bureau des véhicules automobiles, Qué. 1976.

** Dead after hospitalization: special compilation, Quebec Department of Social Affairs.

With respect to deaths before hospitalization, we cannot compare the results of the sampling with the Quebec data. Indeed, a victim who dies on the site of the accident or before arrival at the emergency department of a hospital, cannot have a file at the Third Party and, therefore, cannot form part of our sample. As for deaths after hospitalization, the two results may be compared by relating these deaths to the total number of in-patients. That gives us 2.4% (17/700) in the sample and 2.4% (377/15,459)* for all of Quebec. So the sample is representative of Quebec victims who die after hospitalization.

Distribution of the injured in our sample between those who are hospitalized and those who are not is not representative of all individuals injured on the road in Quebec; the percentages are almost reversed (70% in-patient victims, and 20% out-patients in the sample; and about 30% in-patients and 75% out-patients in the whole of Quebec). This result is not surprising in that our research at the outset was only related to in-patient victims. Our study was extended to out-patient victims because the data was available and we wanted to measure the severity of their injuries. However, at the statistical level, we wanted to give more importance to in-patient victims because these victims generate higher social costs. The TPLS does not develop extensive record linkage when very minor injury is recorded; claim is not warranted.

Moreover, the aim of our study was not to estimate the proportion of in-patient or out-patient victims killed because we could estimate these proportions for all Quebec victims from other more reliable sources (Department of Social Affairs, Department of Transport).

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* 15.459 hospitalized victims include the proportion of unspecified injured that was distributed among hospitalized and non-hospitalized victims.

However, it is reasonable to assume that the representativeness of victims in the sample is valid at the level of victim sub-populations i.e. according to the status and category of road user. For example: In-patient drivers in the sample would be representative of all in-patient drivers in Quebec.

This is why the analysis of the injury profile and the consumption of medical and hospital services will be done at the level of victim sub-populations by distinguishing between in-patient and out-patient victims as well as each of the categories of road users.

Therefore, the main characteristics of accidents and victims in the sample are presented by carefully comparing them with those of all accidents and victims in Quebec (1974) whenever possible.

2. ACCIDENT CHARACTERISTICS

a) Governmental accident registration (Police report)

First we were interested in police records of the 957 accidents (table 9). It was noted at first that 940 out of 957 accidents were reported by the police, giving a proportion of accident registration of 98.2% (100% of fatal accidents were reported, 98.1% of bodily injuries). The quality of registration varies according to the severity of the accident; of the 72 fatal accidents, 59 (81.9%) were reported as fatal whereas 12 (16.7%) were reported as accidents with injuries; and 1 fatal accident was classified as being of unidentified severity.

The bodily accidents (with injuries) are quite accurately reported. Thus, out of 868 accidents, 90.7% were reported accurately. Only one of the "bodily accidents" was reported as being "fatal" whereas 74 (8.5%) were classified as accidents with damage only and 6 (0.7%) as accidents of undefined severity. All the accidents not reported by the police are classified as bodily accidents.

Table 9

Comparative study of the registration of the accidents in the sample according to police records and to our sources.

Severity of accident according to the police	Severity of accident according to our sources		Total (according to the police)
	Fatal[1]	Injured[2]	
Fatal[1]	59	1	60
Injured[2]	12	787	799
Damage only[3]	-	74	74
Unspecified[4]	1	6	7
Not reported[5]	-	17	17
TOTAL (according to our sources)	72	855	957

[1] Accident, minimum one death.

[2] Accident, injuries only

[3] Accident, damage only

[4] Accident reported by police, unspecified severity

[5] Accident not reported by the police.

b) Comparison with all the accidents in Quebec for 1974

We now want to compare the accidents in the sample with all the road accidents in Quebec in 1974. For the accidents in the sample, the severity considered will be that identified by our sources (actual severity rather than severity reported by the police). We should then have three categories of accidents: fatal, injured and unreported.

The following charts (tables 10 to 16) compare certain characteristics of the accidents of the sample to all the accidents in Quebec for the year 1974.

Table 10

Distribution of accidents according to the severity of the accident
Sample and Quebec 1974

Severity of accident	Sample			Quebec 1974		Sample
	Number (1)	% (2)	% (3)	Number (4)	% (5)	Quebec 1974 (6)=(1)÷(4)
Fatal	72	7.5	7.7	1555	4.0	4.6
Injuries	868	90.5	92.3	37577	96.0	2.3
Not reported	17	1.8	-	-	-	
TOTAL	957	100.0	100.0	39132	100.0	

(3) % in relation to reported accidents (940)

(6) % of accidents in Quebec included in the sample

Table 10 shows that our sample contains a greater proportion of fatal accidents (almost double). However, even though our sample is made up of more severe accidents than the mean for Quebec accidents, this does not necessarily imply a set of victims more severely injured than the mean for Quebec accidents. In fact, the majority of deaths are excluded from the sample of victims. It remains to be seen whether the injured survivors of a fatal accident present any special characteristics. This question will be dealt with later in the section on victims' characteristics.

Table 11 shows accident distribution by accident type and morbidity. For fatal accidents, the sample under-represents accidents involving pedestrians, cyclists, stationary objects and other moving objects. On the other hand, accidents involving a collision between two automobiles are largely over-represented (64% as opposed to 39%). With respect to casualties, the representativeness is better (mainly for pedestrian accidents and accidents without collision) although collisions between two motor vehicles remain over-represented in the sample. As for unreported accidents, they are mainly categorized by a high proportion of accidents without collision (given the small number of unreported accidents, this result is not conclusive).

Table 12 presents accident distribution by the month. The sample's accidents reflect the monthly evolution of fatal accidents and casualties over the whole of Quebec: a continuous increase between February and June peaking during the summer months, followed by an equally continuous decrease between July and January. The parallel between the sample and Quebec's monthly distribution of fatal and non-fatal accidents should be emphasized.

Table 13 gives accident distribution by the day of the week. For the whole of Quebec, the injury and fatal accident pattern is the same: fewer accidents during the week days (with a minimum on Tuesdays) and a marked increase during the weekends (maximum on Saturdays). The accidents in the sample reproduce this daily accident cycle rather well, particularly in the case of injury.

Table 14 focuses on an interesting aspect of accidents i.e. the relation between accident severity (fatal, injury) and the type of collision. It shows that there was a frontal collision in close to 60% of the sample's fatal accidents whereas only 25% of injury cases involved frontal collision. In the same way, accidents without collision are more frequent in fatal accidents (15.3%) than in injuries only (9.1%).

Table 15 describes the accident distribution by the larger areas of Quebec. We cannot comment on the representative nature of accident distribution but it should be stressed that fatal accidents and injuries are not distributed in the same way. Certain regions (Quebec, Saguenay-Lac Saint-Jean, Gaspésie, North-West, Trois-Rivières) are more represented among the fatal accidents than among the casualties. The reverse holds for the metropolitan region of Montreal, the South Shore and the Outaouais. Thus, certain areas seem to present more risks than other regions, but our data will have to be more refined before judgement can be passed on the comparative risks of each of the regions. Because of our sample, and the absence of data on regional road usage, it is not recommended to carry out an examination of regional differences, because this evidence will not be conclusive. The type of region where accidents occur is presented in table 16. In our sampling 31% of fatal accidents occur in urban regions and 69% in rural regions. On the other hand, 64% of injury accidents occur in the urban area and only 36% in a rural area. While fatal accidents most often occur on country roads, injury most often occurs on city roads. In spite of the bias of our sample, this result is comparable to those of other studies.

Table 11

Distribution of accidents according to type of accident and morbidity. Sample and Quebec 1974

Type of accidents	Deaths				Injuries				Acc. not reported	
	Sample		Québec 1974		Sample		Québec 1974		Sample	
	Nb	%	Nb	%	Nb	%	Nb	%	Nb	%
AV vs pedestrian	10	13.9	369	26.6	173	19.0	6915	20.0	4	23.5
AV vs AV	46	63.9	547	39.4	551	63.5	17737	51.2	6	35.3
Auto vs auto	42		-		407				3	
Auto vs moto	3		-		125				3	
Auto vs other AV	1		-		13				-	
Moto vs moto	-		-		6				-	
AV vs cyclist	2	2.8	96	6.9	49	5.7	3551	10.2	2	11.8
Auto vs cyclist	2		-		43				2	
Moto vs cyclist	-		-		6				-	
AV vs stat. obj.	4	5.5	185	13.3	29	3.3	3441	9.8	1	5.9
Auto vs stat. obj.	4				29				-	
Moto vs stat. obj.	-				-					
AV without coll.	9	12.5	143	10.3	52	6.0	2335	6.7	4	23.5
Auto without coll.	9				48				1	
Moto without coll.	-				4				3	
AV vs for. obj,	-		2	0.1			103	0.3		
vs train	-		13	1.0			71	0.2		
vs animal	-		0	0.0			82	0.3		
vs mobile post	-		1	0.1			37	0.1		
vs excavation	-		32	2.3			432	1.2		
Total	1	1.4	48	3.5	14	1.6	725	2.1	-	-
Unspecified	-	-	167	-	-	-	2903	-	-	-
TOTAL	72	100.0	1555	100.0	868	100.0	37577	100.0	17	100.0

AV : Automotive vehicle

Table 12

Distribution of accidents according to severity and the month of the year. Sample and Quebec 1974

Month	Death				Injuries				Acc. not reported	
	Sample		Québec 1974		Sample		Québec 1974		Sample	
	Nb	%	Nb	%	Nb	%	Nb	%	Nb	%
January	4	5.6	81	5.2	36	4.1	1993	5.3	-	-
February	4	5.6	69	4.4	34	3.9	1836	4.9	1	5.8
March	3	4.2	109	7.0	31	3.6	2181	5.8	-	-
April	5	6.9	96	6.2	48	5.5	2570	6.8	2	11.8
May	2	2.8	131	8.4	74	8.5	3664	9.8	2	11.8
June	9	12.5	197	12.7	112	12.9	4470	11.9	3	17.6
July	9	12.5	179	11.5	109	12.6	4297	11.4	1	5.8
August	11	15.3	174	11.2	91	10.5	4245	11.3	2	11.8
September	6	8.3	169	10.9	89	10.3	3777	10.1	1	5.9
October	9	12.5	128	8.2	103	11.9	3093	8.2	1	5.9
November	5	6.9	115	7.4	79	9.1	2776	7.4	2	11.8
December	5	6.9	107	6.9	62	7.1	2675	7.1	2	11.8
TOTAL	72	100.0	1555	100.0	868	100.0	37577	100.0	17	100.0

Table 13

Distribution of accidents according to severity and day of the week. Sample and Quebec 1974

Day	Deaths				Injuries				Acc. not reported	
	Sample		Québec 1974		Sample		Québec 1974		Sample	
	Nb	%	Nb	%	Nb	%	Nb	%	Nb	%
Sunday	11	15.3	232	14.9	157	18.1	5462	14.5	3	17.6
Monday	10	13.9	182	11.7	87	10.0	4659	12.4	2	11.8
Tuesday	5	6.9	141	9.1	100	11.5	4508	12.0	3	17.6
Wednesday	4	5.6	170	10.9	103	11.9	4703	12.5	2	11.8
Thursday	10	13.9	193	12.4	107	12.3	5143	13.7	1	5.9
Friday	17	23.6	288	18.5	149	17.2	6494	17.3	4	23.5
Saturday	15	20.8	349	22.5	165	19.0	6585	17.5	2	11.8
Unspecified	-	-	-	-	-	-	23	0.1	-	-
TOTAL	72	100.0	1555	100.0	868	100.0	37577	100.0	17	100.0

Table 14

Distribution of accidents in our sample according to severity and nature of the collision

Nature of the collision	Severity of the accident					
	Death		Injury		Not reported	
	Nb	%	Nb	%	Nb	%
Head on	35	59.3	160	25.5	2	20.0
Back	4	6.8	93	14.9	1	10.0
Side	11	18.6	316	50.5	3	30.0
No collision	9	15.3	57	9.1	4	40.0
Unspecified	1	-	18	-	1	-
Not relevant *	12	-	224	-	6	-
TOTAL	72$_{(59)}$	100.0	868$_{(626)}$	100.0	17$_{(10)}$	100.0

* Not relevant: applies to collisions involving pedestrians, cyclists and objects others than automobile vehicles.

Table 15

Distribution of sample accidents according to severity and area

Area	Severity of accident					
	Death		Injury		Not reported	
	Number	%	Number	%	Number	%
Gaspe - Lower St-Lawrence	4	5.6	34	3.9	1	5.9
Saguenay-Lac-St-Jean	9	12.5	54	6.2	1	5.9
Quebec	19	26.4	139	16.0	1	5.9
Trois-Rivières	9	12.5	83	9.6	1	5.9
Eastern Town ships	3	4.2	42	4.9	1	5.9
Montreal - North Shore	7	9.7	87	10.0	1	5.9
Montreal Metropolitan	6	8.3	253	29.2	7	41.1
South shore of Montreal	6	8.3	114	13.1	3	17.6
Outaouais	1	1.4	27	3.1	1	5.9
North West	6	8.3	24	2.8	-	-
North Coast	2	2.8	9	1.0	-	-
Unspecified	-	-	2	0.2	-	-
TOTAL	72	100.0	868	100.0	17	100.0

Table 16

Distribution of accidents according to severity and type of area

Type of area	Severity of accident					
	Death		Injury		Not reported	
	Nb	%	Nb	%	Nb	%
URBAN:						
City streets	18	25.0	434	50.0	10	62.6
Urban areas	4	5.6	121	14.0	3	18.8
Sub-total		30.6		64.0		
RURAL:						
Main roads	28	38.9	126	14.5	1	6.2
Secondary roads	17	23.6	145	16.7	1	6.2
Other rural zones	5	6.9	42	4.8	1	6.2
Sub-total		69.4		38.0		
UNSPECIFIED	-	-	-	-	1	-
TOTAL	72	100.0	868	100.0	17	100.0

3. VICTIM CHARACTERISTICS COMPARING SAMPLE AND POLICE REPORT

In this section, we will analyse certain characteristics of the victims in the sample (1,008 victims); moreover, they will be compared with victims who were involved in the 957 accidents but are not part of the sample and also with all the victims in Quebec in 1974.

a) Registration of victims

Table 17 presents the following distribution: all the victims of the 957 accidents; victims of the sample; victims for the whole of Quebec in 1974 according to the severity code of injuries prescribed by the police. We added the corrected distribution according to our sources. This table gives an indication of the level and quality of registration of road accident victims.

As the table shows, almost 10% of the sample's victims were not identified by the police. On the other hand, several victims were wrongly classified by the police with respect to their injury severity. This phenomenon is more obvious when we compare the severity code assigned by the police and the status attributed by us to the victim (this status corresponds to the victim's actual situation). This can be done for victims of the sample by distinguishing the in-patient victims (table 18) from the out-patients (table 19).

Table 17

Distribution of victims according to the severity code of the injuries and to two sources (police and our sources). Victims of the 957 accidents, victims of the samples and victims of Quebec 1974.

Severity code of injuries	Victims of the 957 accidents				Victims of the sample				Quebec 1974	
	According to the police		According to our sources		According to the police		According to our sources		According to the police	
	Nb	%	Nb	%	Nb	%	Nb	%	Nb	%
Death	71	3.6	89	4.5	7	0.7	22	2.2	1882	3.4
Hospitalized	874	44.7	1001	51.2	553	54.8	683	67.8	13942	24.9
Went home after treatment	783	40.0	796	40.7	290	28.8	303	30.0	36065	64.4
No treatment	41	2.1	34	1.7	7	0.7	-	-		
Unspecified	89	4.5	35	1.8	54	5.4	-	-	4072	7.3
Unidentified victim	99	5.1	2	0.1	97	9.6	-	-		
TOTAL	1957	100.0	1957	100.0	1008	100.0	1008	100.0	55961	100.0

Table 18

Distribution of the hospitalized victims of the sample according to the severity code of the injury (police) and to the true status of the victims

Severity code of the injury (police)	Status of the victims				
	Hospital < 24 hrs	Hospital > 24 hrs	Death < 24 hrs	Death > 24 hrs	Total
Dead	-	-	4	-	4
Hospitalized	5	491	4	9	509
Went home after treatment	10	118	-	-	128
No treatment	-	1	-	-	1
Unspecified	-	35	-	-	35
Unidentified	-	23	-	-	23
TOTAL	15	668	8	9	700

Table 19

Distribution of the non-hospitalized victims of the sample according to the severity code of the injury (police) and the true status of the victims

Severity code of the injury (police)	Status of the victims				
	Out-patient clinic	Doctor's office	Clinic & office	Death	Total
Dead	-	-	-	3	3
Hospitalized	30	-	12	2	44
Went home after treatment	116	2	44	-	162
No treatment	2	1	3	-	6
Unspecified	12	1	6	-	19
Unidentified	37	9	28	-	74
TOTAL	197	13	93	5	308

b) Comparison between the sample's victims and the whole of Quebec

For certain characteristics, the sample's victims may be compared to victims not belonging to the sample (non-sample) and to all the victims in Quebec (1974). These characteristics are sex, age, category of road user, and the injury severity code according to the police.

Table 20 shows us that the distribution by sex of victims for the three sets considered is similar, i.e. about 62.5% for male victims and 37.5% for female victims. For the age variable, the distributions of the three sets are still quite similar although the proportion of victims older than 45 in the sample (22%) is higher than that observed in the non-sampling (19%) and in all of Quebec's victims (15%). The average age of the sample's victims is 30 years, i.e. 1.6 years higher than the average age of Quebec's victims (table 21).

The distribution of surviving victims according to the category of road users' (table 22) shows greater differences. The drivers (26%) are clearly under-represented in the sample in relation to the victims reported by the police for whom no +PLS file could be found and as compared with the whole of Quebec (34%). On the other hand, pedestrians and motorcyclists are over-represented in the sample, whereas cyclists are slightly under-represented in the sample.

The table shows that 90% of the victims who are not part of the sample, are occupants of motor vehicles whereas they only comprise 61% of the sample's victims and 69% of the victims for the whole of Quebec.

Hence our sample of victims is representative for the variables of age and sex, but is not representative of road users for all the Quebec victims. Our source of data (the Third Party Service of the Q.H.I.B.) favours certain categories of road users, namely the non-occupants of motor vehicles, at the expense of other categories such as the car drivers.

Table 20

Distribution of victims according to sex.
Sample, non-sample
and Quebec 1974

Sex	Victims of the 957 accidents						Victims of Quebec 1974	
	Sample		Non-sample		Total			
	Nb	%	Nb	%	Nb	%	Nb	%
Men	620	61.5	605	63.7	1225	62.5	34981	62.5
Women	388	38.5	344	36.3	732	37.4	20980	37.5
TOTAL	1008	100.0	949	100.0	1957	100.0	55961	100.0

Table 21

Distribution of victims according to age group.
Sample, non-sample
and Quebec 1974

Age group	Victims of the 957 accidents						Victims of Quebec 1974	
	Sample		Non-sample		Total			
	Nb	%	Nb	%	Nb	%	Nb	%
0- 4 years	16	1.6	27	2.8	43	2.2	1536	2.9
5-14 years	143	14.2	72	7.6	215	11.0	7559	14.2
15-19 years	225	22.3	199	21.0	424	21.7	10846	20.4
20-24 years	171	17.0	209	22.0	380	19.4	10881	20.5
25-34 years	138	13.7	179	18.9	317	16.2	9286	17.5
35-44 years	94	9.2	82	8.6	176	9.0	4911	9.2
45-54 years	96	9.5	67	7.1	163	8.3	3829	7.2
55-64 years	64	6.3	51	5.4	115	5.9	2525	4.7
65 and over	61	6.1	63	6.6	124	6.3	1831	3.4
Unspecified	-	-					2757	-
TOTAL	1008	100.0	949	100.0	1957	100.0	55961	100.0

Table 22

Distribution of surviving victims according to category of road users. Sample, non-sample and Quebec 1974.

Category of road users	Victims of the 957 accidents						Victims of Quebec 1974	
	Sample		Non-sample		Total			
	Nb	%	Nb	%	Nb	%	Nb	%
Drivers (car)	253	25.6	326	36.9	579	31.0	17422	34.0
Passengers (car)	352	35.7	472	53.3	824	44.1	18089	35.2
TOTAL	605	61.3	798	90.2	1403	75.1	35511	69.2
Pedestrians	182	18.5	23	2.6	205	10.9	7279	14.2
Cyclists	52	5.3	2	0.2	54	2.9	3245	6.3
Motorcyclists (drivers)	108	11.0	38	4.3	146	7.8		
Motorcyclists (passengers)	33	3.3	22	2.5	55	2.9		
TOTAL MOTO	141	14.3	60	6.8	201	10.7	5032	9.8
Others	6	0.6	2	0.2	8	0.4	254	0.5
Unspecified	-	-	-	-	-	-	2758	-
TOTAL	986	100.0	885	100.0	1869	100.0	54079	100.0

Another characteristic of victims that may be compared between the three categories of victims, is the injury severity code assigned by the police. This code informs us of the state of the victim (dead or alive) and of his status in the medical care system (hospitalized or not). We have seen that this code does not always exactly reflect the victim's real condition (tables 18 and 19). However, for purposes of comparison between the sample's victims and the other sets, we use the original code assigned by the police.

Table 23 shows that the sample's victims present a very different distribution from that of all the victims in Quebec. The deceased victims are under-represented in the sample, whereas the in-patient victims are largely over-represented (61% versus 25%). If all the victims of the 957 accidents are compared with the whole of Quebec, the representation is better for the victims killed, but it is poor for in-patient victims (47% for the set of 957 accidents, and 25% for the whole of Quebec).

So our sample is not representative of all Quebec victims as regards the severity code of the injured assigned by the police. The sample almost entirely excludes the deaths, but it over-represents the hospitalized victims. This is once again related to our data source which is large but not representative of all Quebec road victims.

We will assume that the sample's victims are representative of certain sub-populations of victims. For example, the in-patient drivers would be representative of drivers hospitalized in Quebec and in the same way, the out-patient pedestrians would also be representative of the out-patient pedestrians in Quebec.

However, it is difficult to compare our sample with the whole of Quebec, in relation to these subsets of victims. On the one hand, the data for the whole of Quebec is not easily accessible, and

Table 23

Distribution of victims according to the severity code of injuries (police). Sample, non-sample and Quebec 1974.

Severity code of injury (police)	Victims of the 957 accidents						Victims of Quebec 1974	
	Sample		Non-sample		Total			
	Nb	%	Nb	%	Nb	%	Nb	%
Identified victims								
Dead	7	0.8	64	6.8	71	3.8	1882	3.4
Hospitalized	553	60.7	321	33.9	874	47.0	13942	24.9
Went home after treatment	290	31.8	493	52.0	783	42.2	36065	64.4
No treatment necessary	7	0.8	34	3.6	41	2.2	4072	7.3
Unspecified	54	5.9	35	3.7	89	4.8		
Unidentified victims	97	–	2	–	99	–	–	–
TOTAL	1008	100.0	949	100.0	1957	100.0	55961	100.0

secondly, the reliability of data for the whole of Quebec is questionable with regard to the status of victims (in-patient or out-patient) at least when using data from the Department of Transport.

As for the data from the Department of Social Affairs (Ministry of Health Statistics) on the status of victims, they present some difficulties: first, data are presented on hospitalizations rather than on persons hospitalized (the same person can be hospitalized several times for the same injury); second, an acceptable analysis breakdown on the number of hospitalizations according to different categories of road users, is not available.

4. A COMPARISON BETWEEN POLICE AND HOSPITAL REPORTS

a) Introduction

The statistical analysis of road accident victims is an important stage in the evaluation and application of preventive security measures. However, several studies lead us to believe that official statistics may greatly underestimate the number of victims. A study by Thorson and Sande, carried out in 1969 in Sweden, concludes that only about 50% of severely injured victims are reported in the official statistics. According to Bull and Roberts, who did a study in England in 1970, about 20% of victims are overlooked in official statistics. Using our sample of 1974 road accident victims, we have tried to assess the quality of statistics for road accident victims in Quebec, by comparing data from hospital reports and police reports given by the Department of Transport of the Province of Quebec. We also wanted to give a better assessment of the facts by calculating corrections to statistics published by the Department of Transport.

b) Degree of registration of victims

By comparing police reports, hospital reports, and the medical case report, it was possible to estimate the degree and quality of the records on the victims in our sample: 911 (90.4%) were reported by the police and 97 (9.6%) were not identified. This level of registration is, however, very different according to the victim's status (table 24).

Figure 2 shows the different levels of registration. Thus, all the dead victims were identified by the police whereas only 96.6% of victims actually hospitalized were included in the accident report. Finally, 75.6% of out-patient victims were identified by the police.

FIGURE 2

Percentage of the 1,008 victims recorded by the police

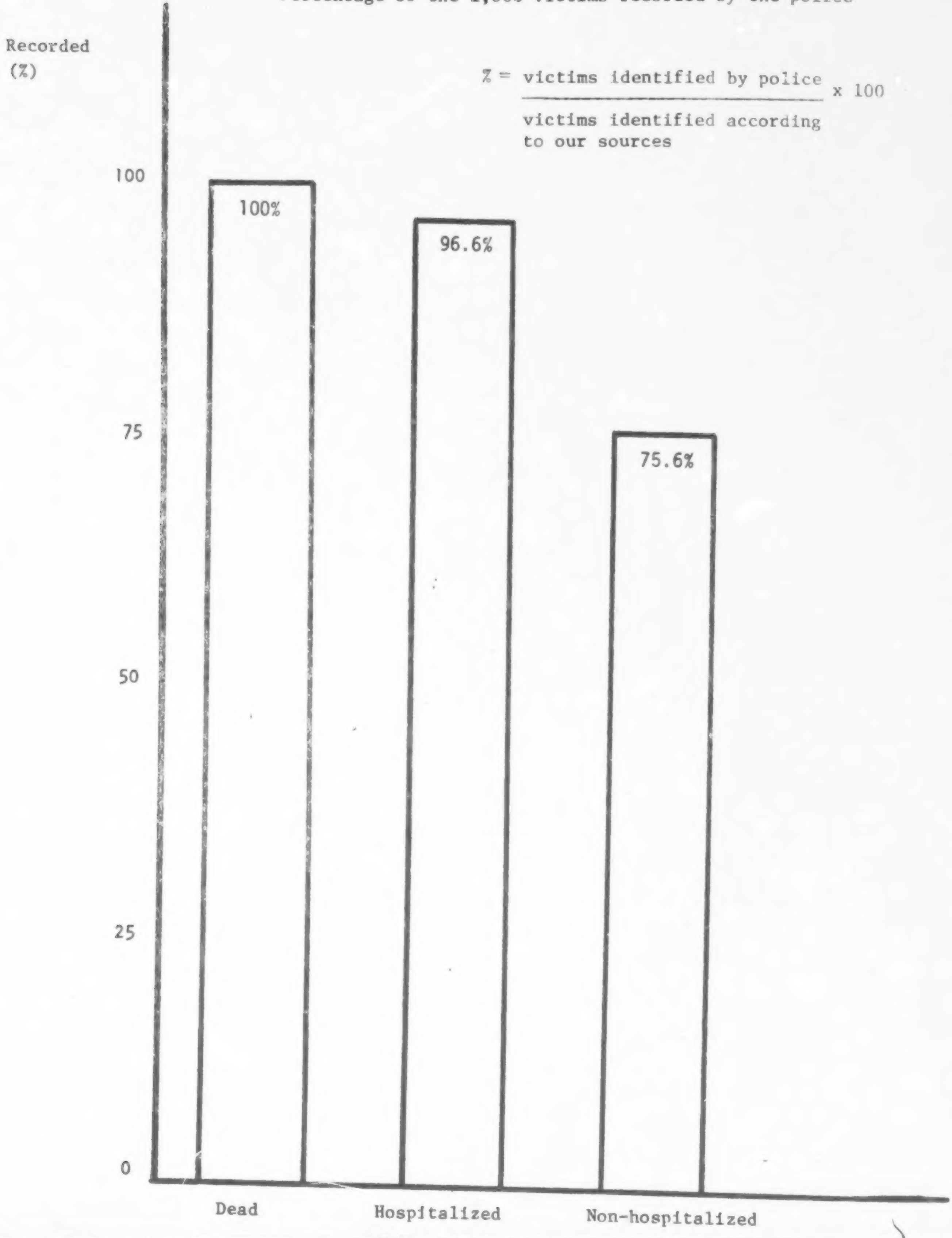


FIGURE 3

Quality of records: distribution of types of victims according to police classification

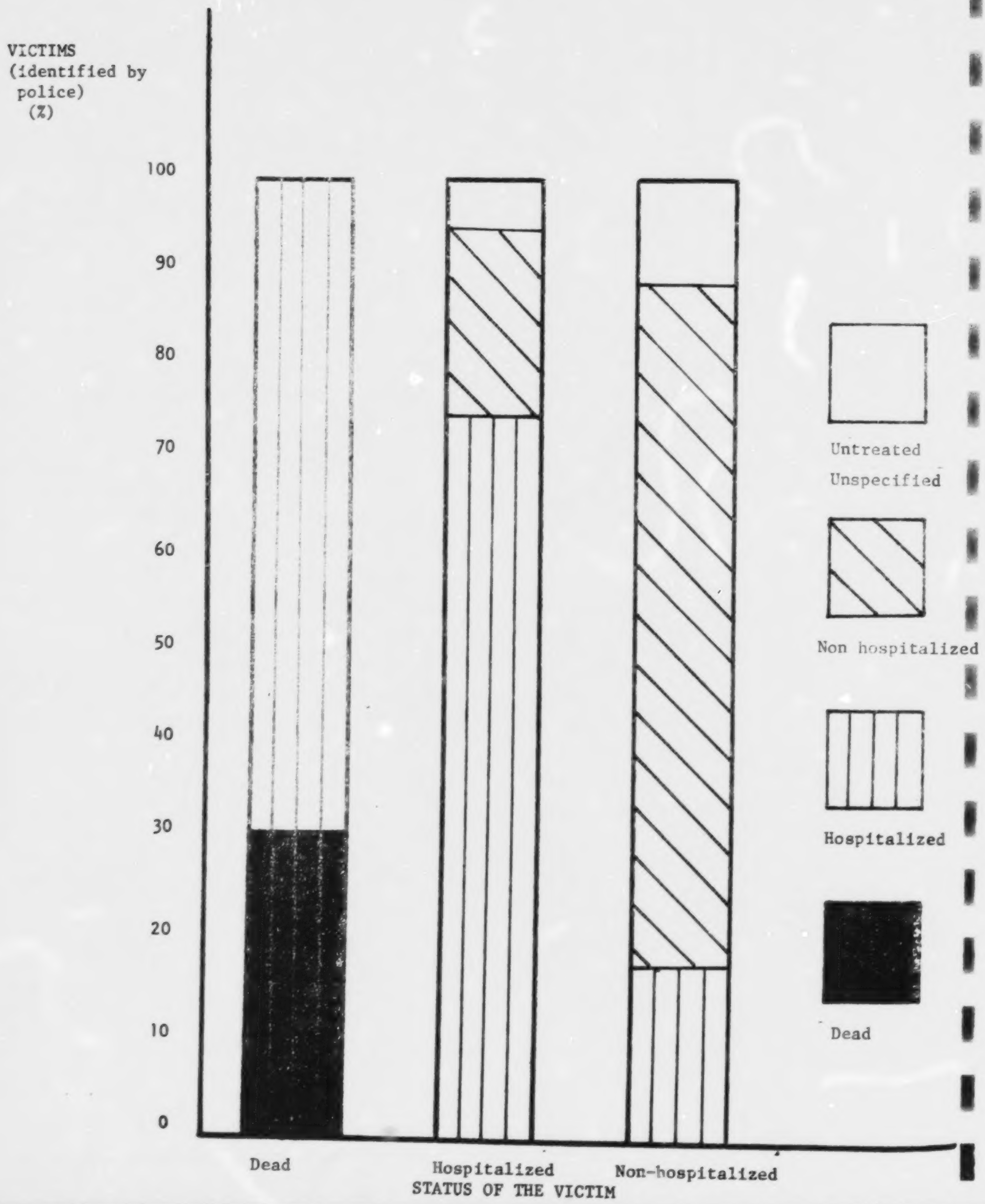


Table 24

Comparative study of police and medical reports concerning classification of victims according to status.

Victims	Classified on the basis of medical records as:			
Reported by police as:	Dead	Hospitalized	Treated as outpatient	TOTAL
Dead	7	0	0	7
Hospitalized	15	496	42	553
Treated as outpatient	0	128	162	290
Untreated	0	1	6	7
Unspecified	0	35	19	54
Not reported by police	0	23	74	97
TOTAL	22	683	303	1008

c) Quality of victim registration

The quality of registration shown by figure 3 calls for the following comments.

The 22 dead victims were all reported by the police but only 7 of them were reported as dead. We must emphasize that none of these deaths occured at the accident site. The deaths were confirmed after arrival at the emergency department of a hospital centre. Nine deaths occured more than 24 hours after the accident, and were less likely to be registered as such by the police. Our data on the deaths, which excludes deaths on sites, cannot permit evaluation of the quality of death registration.

The following observation must be borne in mind about deaths: when Statistics Canada or the statistics of the various provincial or government Transport Departments define accident mortality, different definitions are given. According to the Death Registry (International Nomenclature) a road death is one in which the individual dies within a month after the accident. For the Department of Transport, it means a victim who dies within a year after the accident. Deaths declared by the police probably occured very soon after the accident (24 hours). The Transport Canada Section of Statistics Canada is willing to make corrections on its card indexes for every police statement re accidental death occuring within a year of the accident. These statements, when they do occur, are not made systematically. Once his report has been filed the policeman is not likely to reinvestigate whether the victim subsequently died. An investigation of police procedures would be necessary to find out the exact definition of a road accident death in official statistics. It would be worth making a systematic study of the application of this definition (road crash death) in the provincial and federal Transport Department and in the Death Registry because we strongly suspect that the official definitions of road accident deaths are not or cannot be followed systematically by police departments, not only in Quebec, but in other provinces as well. This could bias inter-provincial comparisons, because a proportion of accidental deaths would be classified as injury.

Among the 683 injured surviving their hospitalization, 496 (72.6%) were reported, 129 (18.9%) were badly classified, 23 (3.4%) were not identified by the police, and for 35 of them (5.1%), the degree of injury severity was not defined. Ten out of the 23 unidentified victims were hospitalized more than six hours after the accident, and for 20 of them, the index of total severity of injuries was lower than or equal to 9, according to the ISS classification scale.

Of the out-patient victims, only 162 out of the 303 injured (53.5%) were accurately reported. Forty-two (13.9%) were classified as in-patients, 6 (2.0%) were codified "without treatment", 74 (24.4%) were unidentified, and for 19 of them (6.3%) the police had not defined the degree of severity of the injuries. In addition, 19 out of 74 unreported victims did not receive care until more than 24 hours after the accident. On the other hand, 51 of the unidentified injured had an injury severity scale (ISS) of between 1 and 3, and 72 of them, of less than 9.

d) Degree of registration by the category of road users

The study by Bull and Roberts in England showed that the level of registration of victims can also vary according to the category of road users. We wanted to study this phenomenon from data in our sample (table 25).

The dead and in-patient victims are, whatever the category of road user, recorded at better than 95%. The out-patient victims have a lower level of registration, at least for certain categories of road users. The occupants of motor vehicles constitute the category of users that presents the highest percentage of non registration by the police. Only 64% of the injured out-patient drivers were reported by the police and 77% of the passengers. For other categories of road users, the level of registration is higher than 95%. So occupants of motor vehicles who already represent more than half of all Quebec's road accident victims (according to Transport Department data) are greatly underestimated. As a matter of fact, a number of drivers involved in one-vehicle accidents are not included in our sample, and they tend to be the most under-reported victims, according to the English Study.

5. COMPARISON BETWEEN OUR DATA AND DATA FROM BULL AND ROBERTS

In their study carried out at the "Accident Hospital" in Birmingham, England, Bull and Roberts found that 29.4% of the

TABLE 25

Recording of victims according to category of road users and status of the victims

Victims	Car driver			Car passenger			Pedestrian			Cyclist			Motorcyclist			Others			All categories			TOTAL
	D	H	O	D	H	O	D	H	O	D	H	O	D	H	O	D	H	O	D	H	O	
Reported by the police	5	154	61	7	214	98	7	153	25	1	39	10	2	95	35	-	5	-	22	660	229	911
Not reported by the police	-	4	34	-	10	30	-	1	3	-	2	1	-	5	6	-	1	-	-	23	74	97
TOTAL	5	158	95	7	224	128	7	154	28	1	41	11	2	100	41	-	6	-	22	683	303	1008

(D: dead H: hospitalized O: out-patient)

Bull and Roberts found that 29.4% of the 100 road accident victims treated at this hospital each month of the year 1970 were not reported by the police. However, this result is not directly comparable to ours because their sample includes victims of accidents where only one vehicle was involved (including bicycles), and in which only the driver is injured - a category that is completely lacking in our study. If we remove the 191 victims of this type considered by Bull and Roberts, we calculate a sub-estimate of victims by the police of 19.7%. This result cannot be compared to the 9.6% of our sample because of the difference in distribution of victims according to the injury severity in the two studies.

The victims of the British study are distributed over three categories: killed, severely injured and slightly injured. The class of severely injured comprises in-patients but also a certain number of out-patient victims presenting fractures, concussions and severe lacerations. This category therefore encompasses all the in-patient victims from our study, but also a certain proportion of the injured treated on an out-patient basis, including the most severely injured. If we suppose that this classification approaches ours sufficently, we can try to compare the registration of victims by the police.

In the two studies, all those killed were reported by the police. Of the in-patient or severely injured victims, 8.4% were not identified in the English study as opposed to 3.4% in our study, for out-patient victims, the percentages were 25.4% as opposed to 24.4% (table 26). The degree of non-identification of victims is therefore slightly higher in the English study than in ours, but the difference is mainly in severely injured victims, and arises partly from the fact that this category includes the injured treated only as out-patients and classified as such in our study.

The quality of registration for accidents reported in the British study is, however, higher than that of our study.

TABLE 26

Comparison of level and quality of recording of victims between the English and the Quebec studies.

Victims	Victims reported by the police								Not reported by the police		TOTAL	
	Well reported		Reported as being too severe		Reported as being not severe enough		Unspecified					
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Dead	15	7	-	-	-	15	-	-	-	-	15	22
Hospitalized	255	496	-	-	42	129	-	35	26	23	323	683
Non-hospitalized	528	162	7	42	-	6	-	19	173	74	708	303
TOTAL	798	665	7	42	42	150	-	54	199	97	1046	1008

(1) English study (2) Quebec study

Indeed, of the 847 cases reported in Bull and Roberts' study (including 37 drivers injured in accidents involving one motor vehicle only), the dead victims were all correctly reported. The same holds true for 85.9% of the severely injured victims, and 98.7% of those slightly injured. In our study, only 31.8% of those killed were properly reported, 72.6% in-patients and 53.4% out-patients. While the degree of registration by the police is a little higher in our study, the quality of the recording is higher in the British study.

If we study the level of registration of road accident victims according to the category of road users (table 27) we notice that the same categories are always less well reported. Hence if we exclude from the British study the 191 victims not included in our sample we find that automobile occupants are the least accurately reported, followed by motorcyclists, pedestrians and cyclists. In our study, the order is reversed. However the degree of registration is weaker for all categories of road users in the study by Bull and Roberts.

6. STATISTICS FROM THE DEPARTMENT OF TRANSPORT: ESTIMATED CORRECTIONS

Quebec's Department of Transport publishes annual statistics on the number of road accident victims, derived from police reports. In 1974, 1,882 dead victims and 54,079 injured were listed for the whole of Quebec. Moreover, special data were obtained on the distribution of victims according to the injury severity code attributed by the police: killed, hospitalized, treated in the out-patient department and not treated.

The 4,072 victims classified in the categories "without treatment" and "undefined treatment" were distributed among the injured out-patients, and treated in an out-patient department according to the proportions calculated in our sample. Thus, by using the missing percentages of injured in-patients (3.4%) and out-patients (24.4%) calculated in our sample, we were able to correct the data obtained from the Department of Transport.

Two other corrections were also made. The first deals with the sub-registration of a category of victim not included in our sample - victims from accidents in which only one motor vehicle was involved, and the driver injured. We used the results calculated in Bull and Robert's study for the Birmingham area in England. According to this study, 3.9% of all victims come from this category of accidents and were not reported.

The second correction considers cyclists injured in an accident in which no motor vehicle was involved. This type of accident does not correspond to the definition of road accidents that must be reported by the police, but we decided to make the correction in order to compare transport and hospital data. Indeed, we have every reason to believe that at least some of these victims are counted among victims of road accidents in the hospital statistics.

TABLE 27

Comparative study of the level of recording victims according to the category of road users English and Quebec studies

Category of road users	Reported by police		Not reported by police	
	(1)	(2)	(1)	(2)
Car (driver)	146	220	38	38
Car (passenger)	237	319	80	40
Motorcyclist	83	132	20	11
Cyclist	35	50	5	3
Pedestrian	309	185	55	4
Snow mobile (driver)	-	5	-	1
TOTAL	810	911	199	97

Table 28 presents the original and corrected statistics of road accident victims in Quebec in 1974, from figures given by the Transport Department.

According to our estimates, the Quebec Department of Transport underestimates the number of road accident victims by about 22% (comparing 72,035 to 55,961).

7. STATISTICS FROM THE DEPARTMENT OF SOCIAL AFFAIRS

The Quebec Department of Social Affairs (DSA) supplies data on the number of hospitalizations and the number of admissions in an emergency department or an out-patient clinic, following a road accident. These figures include readmissions and multiple visits, and, consequently, cannot be included in the number of road accident

TABLE 28

Road accident victims: original statistics corrected by the Quebec Department of Transport, 1974

Victims	Original number	Corrected number
Dead	1,882	1,882
Injured	54,079	67,344
Hospitalized	13,942	15,082
Non-hospitalized	36,065	52,262
Untreated and unspecified	4,072	-
TOTAL	55,961	69,226
TOTAL WITH:		
(1) Correction for victims not included in sample (3.9%)		72,035
(2) Correction for (1) and cyclists only (12.8%)		79,388

victims. For purposes of comparison with the Transport data, the number of services must be translated into number of persons who received medical services.

In 1974, the DSA quoted the figure of 1,925 (published by the Quebec Death Registry) as the total number of deaths attributable to a road accident. On the other hand, the number of hospitalizations of road accident victims in Quebec is estimated at 20,931, which includes 377 deaths that occured less than a year after the date of the accident. The 1973 data on hospitalizations, according to the ICDA diagnostic code, lead us to doubt the accurate registration of victims. In fact, it was found that 14% of all hospitalized road accident victims in 1973 were given a diagnosis (according to the ICDA code) that does not correspond to immediate or long term follow-up of injuries sustained. However, it is possible that the error arises from the identification of the type of accident and that those road accident victims classified as being injured might not have been injured at all.

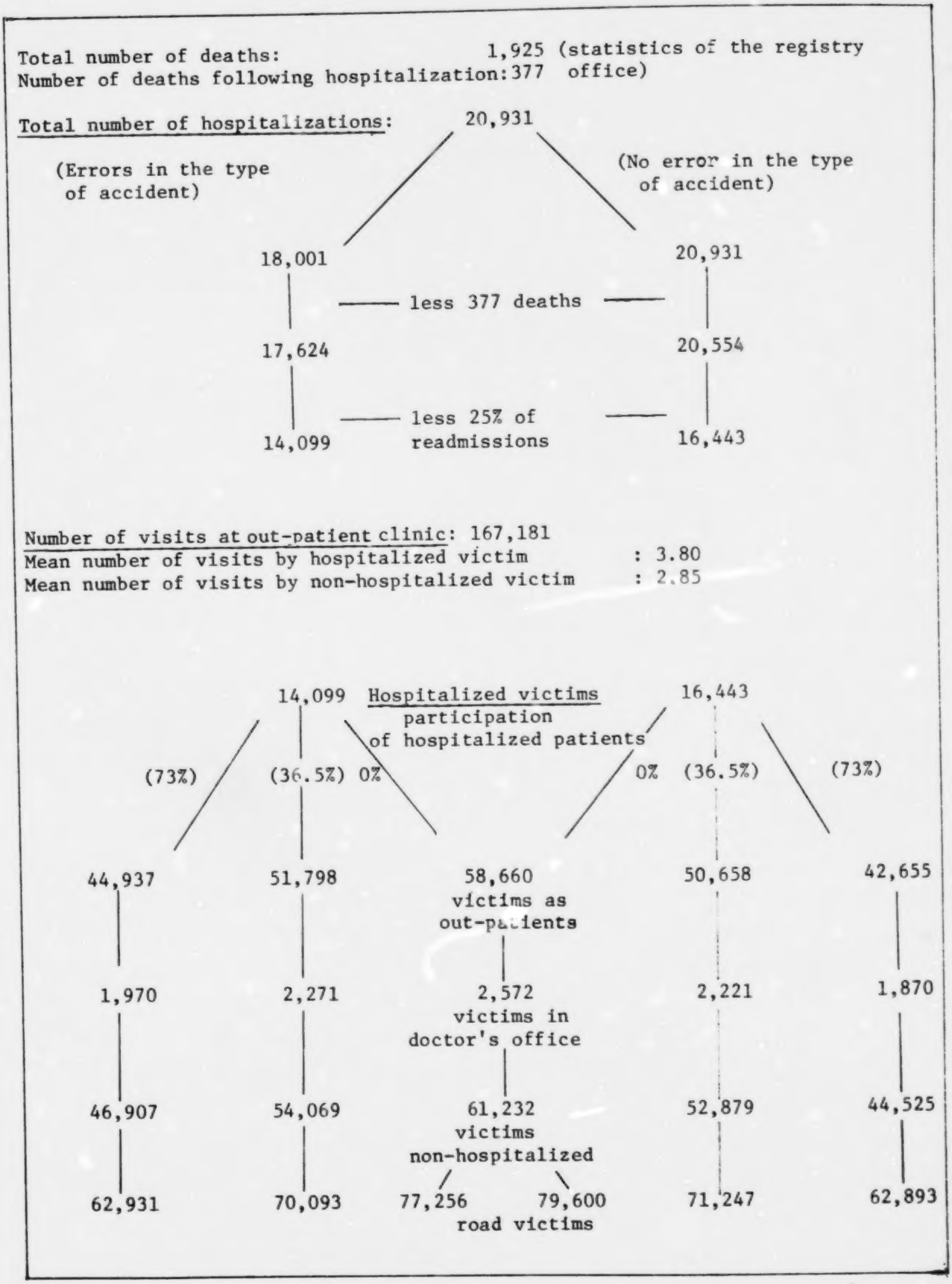
The first correction of the number of hospitalizations takes these factors into account. On the one hand, if all the errors were made in attributing diagnoses (ICDA code) then the number of hospitalizations remains unchanged. If, however, all the errors relate to the type of accident, one has to decrease the number of hospitalizations by 14%. The number of hospitalizations is therefore established at between 18,000 and 20,931, a number from which the 377 deaths after hospitalization must be subtracted before adjusting the figure according to the proportion of readmissions.

According to the DSA, the total number of hospitalizations includes about 25% of readmissions. This percentage corresponds to the one calculated from our sample, if we correct the distribution of our victims according to the category of road users on the basis of the distribution by the Department of Social Affairs. With this second correction, we calculate the number of hospitalized victims following a road accident as being between 14,099 and 16,443 (table 29).

Next, we have to evaluate the number of out-patients and those treated in the emergency department or out-patient clinic. In 1974, the DSA reports a total of 167,181 consultations of this kind. This number does not include emergency visits preceding hospitalizations, nor the visits to a private office, but it does include the visits of in-patient victims after their discharge from the hospital. In our study, it was estimated that 73% of hospitalized victims return to the out-patient department, making an average of 2.85 visits. We calculate from these data that between 42,655 and 44,937 out-patient victims have been treated at a hospital centre following a road accident.

TABLE 29

Estimation of the number of victims of road accidents based on data obtained from the Department of Social Affairs (hospital reports), Quebec 1974.


Total number of deaths: 1,925 (statistics of the registry office)
Number of deaths following hospitalization: 377
Total number of hospitalizations: 20,931
(Errors in the type of accident)
(No error in the type of accident)
18,001
20,931
less 377 deaths
17,624
20,554
less 25% of readmissions
14,099
16,443
Number of visits at out-patient clinic: 167,181
Mean number of visits by hospitalized victim : 3.80
Mean number of visits by non-hospitalized victim : 2.85
14,099
Hospitalized victims participation of hospitalized patients
16,443
(73%)
(36.5%)
0%
0%
(36.5%)
(73%)
44,937
51,798
58,660 victims as out-patients
50,658
42,655
1,970
2,271
2,572 victims in doctor's office
2,221
1,870
46,907
54,069
61,232 victims non-hospitalized
52,879
44,525
62,931
70,093
77,256
79,600
road victims
71,247
62,893

Certain hypotheses must be advanced concerning the percentage of in-patient victims treated in the out-patient department. When the patient returns for consultation to the same hospital where he was hospitalized, this visit is not likely to be taken into consideration. If this percentage is equal to 0 in the extreme, the number of injured out-patients treated in the hospital is 58,660.

To the total of out-patient victims treated at the hospital, we have to add victims treated in the physician's private office. According to our sample, this category of victims represents 4.2% of all injured out-patients. Table 30 presents the results of our various hypotheses.

The total number of road accident victims estimated from the hospital reports is therefore between 62,893 and 79,600 and more probably, between 70,093 and 79,600 (assuming that 36.5% of in-patients return to the out-patient clinic). The number of road accident victims thus calculated is estimated as being quite close to the number obtained by correcting data from the Department of Transport.

Therefore, by calculating estimates from different sources in two different ways, approximately similar results are obtained.

This is why we used the valid hypothesis of an estimate of 72,000 injured/54,000 declared as being injured.

TABLE 30

Road accident victims: comparative study between the corrected data obtained from the Department of Social Affairs (hospital reports) and that of the Department of Transport (police reports), Quebec 1974.

Victims	Department of Transport	Department of social affairs					
		Errors in types of accidents			No error in types of accidents		
		(1)	(2)	(3)	(1)	(2)	(3)
Dead	1,882	1,925	1,925	1,925	1,925	1,925	1,925
Injured	67,344	61,006	68,168	75,331	60,968	69,322	77,675
Hospitalized	15,082	14,099	14,099	14.099	16,443	16,443	16,443
Treated in hospital as	52,262	44,937	51,798	58,660	42,665	50,658	58,660
Treated in doctor's office		1,970	2,271	2,572	1,870	2,221	2,572
TOTAL	69,226	62,931	70,093	77,256	62,893	71,247	79,600

(1) Participation of 73% of hospitalized victims in out-patient clinic.

(2) Participation of 36.5% of hospitalized victims in out-patient clinic.

(3) Participation of 0% of hospitalized victims in out-patient clinic.

OBJECTIVE II:

Classification of road accident victims according to the nature and severity of their injuries.

OBJECTIVE III:

Consumption of medical and hospital services secondary to road crash injuries and direct costs.

1. Objective II Classification of road accident victims according to the nature and severity of their injuries

Description of the profile of injuries will be made by distinguishing each type of victim (in-patient and out-patient) and each category of road user. We are concerned with describing the nature and severity of injuries sustained by victims from each of the subsets.

From Third Party files, we tried to identify all the injuries sustained by each of the victims and then to evaluate their severity by using the severity scale developed by the AAM* i.e. AIS or the Abbreviated Injury Scale. Moreover, we calculated an index of total injury severity for each of the victims i.e. by using the Injury Severity Score (ISS) suggested by American research workers.

For all 1,008 victims, we identified 2,164 injuries i.e. 2.15 injuries per victim. This number varies according to the type of victim (table 31). Thus, the in-patient victims have, on average, 2.4 injuries, which is 50% higher than out-patient victims. The variations between categories of road users are negligible, both for in-patient victims and for out-patients (the variance analysis has not suggested significant differences between the averages).

a) Nature of the injuries

First, lets examine how injuries sustained by the different road users are distributed according to the nature of the injuries. This will allow us to establish a profile of injuries for each of the categories of road users.

Table 32 presents this distribution for out-patient victims by distinguishing each of the categories of road users.

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* The American Association for Automotive Medicine

TABLE 31

Mean number of injuries according to status and category of road users

Category of road users	Status	
	Hospitalized	Non-hospitalized
Driver	2.45	1.58
Passenger	2.42	1.59
Pedestrian	2.26	1.66
Cyclist	2.55	2.00
Motorcyclist (driver)	2.36	1.41
Motorcyclist (passenger)	2.25	1.57
Others	3.00	-
TOTAL	2.39	1.59

TABLE 32

Distribution of 100 injuries for each category of road users according to the nature of the injury.
Non-hospitalized victims.

Nature of injury	Category of road users						
	Driver	Passenger	Pedestrian	Cyclist	Motorcycle Driver	Motorcycle Passenger	Total
Concussion	3.3	3.5	10.4	-	4.9	-	3.9
Simple Fracture	11.7	18.2	20.8	36.4	36.6	31.8	19.5
ODC fracture*	1.3	1.0	2.1	-	2.4	-	1.2
Laceration	31.4	27.6	14.6	22.7	17.1	9.1	25.6
Contusion	18.9	24.6	29.2	18.2	24.4	50.0	24.1
Sprain	24.2	15.3	10.4	-	-	4.6	15.1
Pain	3.3	1.0	-	4.5	-	-	1.7
Wound	3.3	5.4	8.3	18.2	4.9	-	5.3
Dislocation	2.0	0.5	2.1	-	4.9	-	1.4
Burns	-	1.0	-	-	2.4	-	0.6
Haemothorax	0.6	-	-	-	-	-	0.2
Others	-	1.4	2.1	-	-	-	0.8
Unspecified	-	0.5	-	-	2.4	4.5	0.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Numbers							

* Open, displaced or comminuted fracture.

This table shows that the frequency of certain types of injury varies a great deal according to the category of road user. The basic distinction is between occupants of automobiles and non-occupants of automobiles.

With the drivers and passengers of automobiles, there is a high percentage of injury (50%) in the form of lacerations and contusions. Sprains and dislocations follow, then fractures (mainly simple fractures). Concussions are less frequent in this type of victims.

On the other hand, the non-occupants of automobiles are characterized by a greater proportion of fractures (20%-36%) and concussions (10% in pedestrians). Sprains and dislocations are less frequent, mainly in cyclists and motorcyclists. Cuts and contusions constitute an important percentage of injuries (about 40%) as with occupants of automobiles.

Table 33 presents the same distribution of injuries for in-patient victims. We note at first the presence of more severe injuries that are the cause of hospitalizations in victims (more complicated fractures, ruptures, amputations, haemopneumothorax). However, in-patients, like out-patients, may be separated into two groups as to the nature of their injuries: automobile occupants and non-occupants.

In automobile occupants simple fractures predominate, being as important as lacerations and contusions (about 30%). If the multiple fractures (12%) are added to the concussions (8%), we already have 80% of all types of injuries sustained by automobile occupants.

Non-occupants of automobiles are characterized by a strong proportion of fractures, and in particular multiple fractures (mainly

TABLE 33

Distribution of 100 injuries for each category of road users according to the nature of the injury.
Hospitalized victims

Nature of the injury	Category of road users							
	Driver	Passenger	Pedestrian	Cyclist	Moto. Driv.	Moto. Pass.	Other	Total
Concussion	7.6	7.7	10.8	16.8	4.2	11.1	-	8.5
Simple fracture	30.6	30.5	28.5	30.8	32.3	11.1	44.4	30.0
ODC fracture*	11.7	11.6	21.1	15.0	30.2	28.9	11.1	16.4
Laceration	19.0	15.9	6.6	8.4	9.0	4.5	27.7	13.2
Contusion	11.6	15.2	17.2	17.8	6.3	24.4	5.6	14.1
Sprain	5.1	3.7	1.1	1.9	2.6	4.5	-	3.2
Pain	2.3	1.2	1.7	0.9	1.1	-	-	1.5
Wound	3.8	4.5	4.2	3.8	5.8	8.9	-	4.4
Dislocation	1.8	2.8	2.2	1.9	4.2		-	2.4
Burns	-	0.2	-	0.9	-	-	5.6	0.2
Haemorrhage	1.5	1.1	1.1	-	-	-	-	1.0
Rupture	1.5	1.6	3.0	0.9	1.1	-	-	1.7
Amputation	-	-	0.2	-	1.1	2.2	-	0.2
Evulsion Perforation Crushing Obstruction	0.5	0.9	0.5	0.9		-	5.6	0.7
Haemothorax	1.3	0.7	0.8	-	-	-	-	0.7
Pneumothorax	1.5	1.1	0.8	-	0.5	2.2	-	1.0
Shock	-	1.1	-	-	-	-	-	0.4
Others	0.2	0.2	-	-	1.6	2.2	-	0.4
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No of injuries								

* Open, displaced or comminuted fracture

in motorcyclists and pedestrians). In the same way, it must be stressed that there is a greater percentage of brain concussions in cyclists. Motorcyclists seem more protected from brain concussions because they wear protective headgear. This is a cautious observation, because our sample does not deal with deaths on impact.

b) Injury areas

Using injuries which served to calculate the ISS index, we present a distribution of injuries according to the part of the body that has been wounded. Here, only the most severe injuries to each part of the body are considered, up to a maximum of three parts. This procedure has the advantage of giving a better picture of the injury profile by avoiding victim characterization by the same part of the body more than once.

First we will examine the average number of regions injured according to the different categories of road users (table 34).

TABLE 34

Mean number of body areas affected according to category of road users. Hospitalized and non-hospitalized victims

Category of road users	Victims	
	Hospitalized	Non-hospitalized
Driver	1.75	1.39
Passenger	1.77	1.35
Pedestrian	1.63	1.48
Cyclist	1.83	1.45
Motorcycle (driver)	1.46	1.10
Motorcycle (passenger)	1.55	1.07
Others	1.33	-
Total	1.69	1.34

The variance analysis brought to light certain significant differences with respect to the number of anatomical regions injured. Thus, motorcycle drivers (in-patient or not) are injured in fewer parts of the body than car occupants and cyclists. In other words, injuries sustained by motorcyclists are localized in a much smaller number of body regions (the extremities mainly). This does not mean that they are less severely injured; but this phenomenon could influence the evaluation of the severity of their injuries with the help of the ISS which takes into account the number of injured areas.

Tables 35 and 36 present the distribution of 100 injuries for each category of road users according to the AIS region. This term arises from the fact that the delineation of the parts of the body is made in conformity with that adopted by the Abbreviated (AIS) scale. (See Appendix IV, p. 187).

TABLE 35

Distribution of 100 injuries for each category of road users according to body area. Non-hospitalized victims.

Body Area	Category of road users						
	Driver	Passenger	Pedestrian	Cyclist	Moto. Driv.	Moto. Pass.	Total
General	6.0	5.2	4.6	12.5	16.0	7.1	6.6
Head-neck	34.6	20.8	18.6	12.5	6.5	14.3	23.4
Face	27.8	37.6	20.9	31.2	6.5	-	28.8
Chest	11.3	5.8	-	6.3	-	7.1	6.6
Abdomen	1.5	2.3	4.7	-	-	-	1.9
Limbs	18.8	28.3	51.2	37.5	71.0	71.5	32.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No of non-hosp. victims							

TABLE 36

Distribution of 100 injuries for each category of road users according to body area. Hospitalized victims.

Body area	Category of road users							
	Driver	Passenger	Pedestrian	Cyclist	Moto. Driv.	Moto. Pass.	Other	Total
General	2.1	6.6	4.2	2.6	3.6	6.7	-	4.4
Head-neck	24.5	21.2	24.3	30.3	11.6	20.0	11.1	22.2
Face	22.3	24.6	9.3	17.1	8.0	6.7	22.2	18.2
Chest	16.3	10.1	5.4	1.3	5.4	3.3	11.1	9.4
Abdomen	8.2	7.9	8.9	5.3	7.1	10.0	11.1	8.0
Limbs	26.6	29.6	47.9	43.4	64.3	53.3	44.5	37.8
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

First of all it must be emphasized that there is an initial distinction between in-patient victims and out-patients, with respect to facial injuries (more frequent in out-patients) and chest and abdomen injuries (more frequent in in-patients). By saying that some anatomical regions are more frequent, we mean that they are among the most frequently injured. In other words, our distribution attributes an order of importance to the different regions.

There is quite a distinct profile of injuries (according to the region) between occupants and non-occupants of automobiles. In the former, the head and neck regions are of more distinct importance. The same goes for chest injuries (mainly for drivers). Non-occupants of automobiles are characterized by a strong proportion of limb injuries (with a maximum of 65% for motorcyclists). On the other hand, injuries to the face are less important in this type of victims.

c) Injury severity

Classification of each type of victim according to injury severity, can be done with the help of several indices. The average severity of all injuries sustained by one type of victim can be used, or the average severity of the most severe injury. In the second case, we can also consider the region of the injury. Finally, the victims can be compared according to the total average severity of their injuries by using the ISS index, derived from the AIS index.

The AIS index was used to determine injury severity. This index, developed by the American Association for Automotive Medicine, evaluates the risk to the victim represented by a specific injury (threat to the victim's life). This scale has been the subject of several tests by various researchers and has proved to be very effective in considering the actual severity of injuries sustained by road accident victims.

The ISS index was developed to give a single synthetic index per victim. It takes into account a maximum of three injuries per victim. The three most severe injuries are localized in different parts of the body. We then have to calculate the sum of the squares of the severity indices (AIS) for each of these injuries.

Thus, the ISS index = $\sum_{i=1}^{3} (AIS)_i^2$.

Tables 37 and 38 show the different severity indices for each category of road users. The first index is the average severity of all injuries sustained by a category of road users according to the AIS scale. The second index gives the average severity of the most severe injury in a victim according to the AIS scale. The same index is then given for each of the anatomical regions. Finally, the third index shows the total severity of injuries for a victim (index ISS).

TABLE 37

Index of severity of the wounds (AIS and ISS) according to category of injured. Non-hospitalized victims.

Index of severity	Category of road users						
	Driver	Passenger	Pedestrian	Cyclist	Moto. Driv.	Moto. Pass.	Total
Mean AIS of all injuries	1.37	1.35	1.52	1.60	1.60	1.38	1.40
Mean AIS of the worst injury:							
All areas	1.46	1.48	1.83	1.64	1.71	1.46	1.54
Head and neck	1.33	1.35	2.17	1.40	2.00	1.00	1.42
Face	1.24	1.33	1.20	2.00	1.00	-	1.31
Chest	1.55	1.88	-	1.00	-	2.00	1.67
Abdomen	2.00	1.00	2.00	-	-	-	1.50
Limbs	2.00	1.81	1.88	1.80	1.86	1.50	1.83
Mean ISS	3.07	2.99	4.41	3.64	3.46	2.46	3.20

TABLE 38

Index of severity of the injuries (AIS and ISS) according to the category of road users. Hospitalized victims.

Index of severity	Category of road users							
	Driver	Passengers	Pedestrian	Cyclist	Moto. Driv.	Moto. Pass.	Other	Total
Mean AIS of all injuries	2.08	2.07	2.33	2.05	2.23	2.16	2.11	2.15
Mean AIS of the worst injury:								
All areas	2.64	2.60	2.83	2.52	2.78	2.70	3.33	2.69
Head and neck	2.37	2.53	2.90	2.33	2.33	2.50	3.00	2.55
Face	2.37	2.25	1.67	1.50	2.00	-	3.00	2.22
Chest	2.85	2.93	3.00	-	2.66	3.00	-	2.89
Abdomen	3.12	3.29	3.58	3.50	3.20	-	5.00	3.33
Limbs	2.69	2.58	2.77	2.76	2.83	2.73	3.00	2.72
Mean ISS	10.01	9.80	11.09	9.19	9.43	9.20	14.33	10.05

First we compare in-patient and out-patient victims. A greater severity is observed for in-patients whatever the index of severity used. The average severity of an injury for an in-patient victim is about one and a half times that for an out-patient. The difference is greater when we consider the average severity of the most severe injury (one and three quarters). The average ISS for in-patient victims is, however, about three times higher than that for out-patients.

Let's examine the differences between categories of road users. No difference was found between drivers and passengers of automobiles, whatever the chosen index. Pedestrians are the ones who stand out from other categories of road users. Thus, according to the index of average severity of the most severe injury, pedestrians are more severely injured than automobile occupants and cyclists. No difference was found with respect to motorcyclists. Pedestrians also stand out because of an increased injury severity in the head and neck regions.

According to the ISS index, the only significant difference is between out-patient pedestrians and automobile drivers and passengers who are not hospitalized (pedestrians were more severely injured than occupants of automobiles). We expected motorcyclists to stand out from other categories of road users with respect to injury severity but this was not the case. They are as severely injured as pedestrians but statistically there was no significant difference as compared to other categories of road users. The last result might be linked with the data used: in the validity test, ISS was slightly lower than ISS registered for the same victims by using the full hospital medical record. Therefore, it is useful to look at other indirect measures of severity found in our data: length of hospitalization, length of total treatment.

2. Objective III Consumption of medical and hospital services secondary to road crash injuries and direct costs

The consequences of road accidents are also show up in the consumption of medical and hospital services. We will now examine the progress of injured people, through the medical and hospital care system. By the same token, we will be able to look at the validity of the different indices used to measure the severity of the victims' injuries.

With the data in our possession, it was possible to follow the medical treatment of each of the victims either at the out-patient clinic, the hospital or the physician's office. This leads us to estimate average consumption of medical and hospital services for each category of road users, as well as the cost of these services (table 39).

Among in-patient victims, pedestrians stand out because of the length of their stay in hospital, which is almost double that of drivers. Motorcyclists, on the other hand, are the victims who are most often hospitalized (1.6 times) and who return most often to the out-patient clinic or the physician's office. Moreover, this entails a length of treatment much longer than that of other road users (7 to 8 months). In terms of direct total costs, pedestrians generate the highest costs ($3,163) followed by motorcyclists.

Whereas in-patient cyclists incur lower direct costs than other road users, out-patient cyclists in turn incur higher costs than other out-patient victims. Costs of services received by out-patient victims ($117 on an average) are considerably lower than those received by in-patient victims ($2,379 on an average).

TABLE 39

Utilization of medical and hospital services according to the category of road users and direct medical costs, Quebec 1974.

Category of road users	Hospitalizations			Outpatient clinic		Visits to the doctors' cabinet	Length of treatment (days)	Medical acts		Direct Cost total
	Number	Length of stay (days)	Cost	Nb of visits	Cost			Number	Cost	
Hospitalized victims										
Drivers	1.27	16.18	1519.48	2.81	34.32	2.03	155.08	20.77	335.70	1889.50
Passengers	1.26	19.83	1787.80	2.38	25.73	1.58	130.77	19.31	289.07	2102.60
Pedestrians	1.40	31.31	2795.30	2.49	25.02	2.27	152.45	28.32	343.17	3163.49
Cyclists	1.19	17.74	1434.95	2.40	27.17	0.74	150.67	13.81	215.33	1677.45
Motorcycle (driv)	1.61	22.54	2159.76	4.74	44.16	2.54	253.90	24.34	567.39	2771.31
Motorcycle (pass)	1.60	28.25	2449.35	4.35	42.75	0.10	215.65	21.52	282.10	2774.20
Others*	1.17	33.50	3172.17	2.83	26.50	0.33	158.50	19.33	429.67	3628.34
TOTAL	1.34	22.16	$2008.48	2.83	$30.23	1.85	159.25	21.82	$340.55	$2379.26
Non-hospitalized victims										
Drivers				2.48	31.87	3.87	56.82	14.15	110.27	142.14
Passengers				2.94	32.27	0.91	44.55	6.97	75.06	107.33
Pedestrians				3.14	33.52	1.83	55.93	7.96	83.28	116.80
Cyclists				3.18	34.55	2.73	117.91	12.27	120.09	154.64
Motorcycle (driv)				2.31	28.10	0.59	28.21	4.34	52.17	80.27
Motorcycle (pass)				2.79	31.71	0.50	25.79	4.72	48.86	80.57
TOTAL				2.76	$31.93	1.94	50.09	9.17	$ 85.19	$117.12
TOTAL				2.81	$30.75	1.88	125.90	17.95	$262.52	

*only 6 cases

3. Discussion of objectives II and III

The preliminary analysis of data from our records made it possible to describe the principal immediate consequences of road accidents for victims. We therefore defined a profile of injuries and medical treatment for each category of road user.

From the profile of injuries, we were able to observe certain distinctions particularly between occupants and non-occupants of automobiles. Injuries sustained by drivers reflect their position in the automobile: i.e. proximity to the windshield (facial and head injuries), proximity to the steering wheel (injuries to the chest and abdomen) and positioning of the lower limbs (lower limb injuries). This profile of injuries at the three levels mentioned above, has been found to be characteristic of drivers.

Injuries sustained by automobile passengers reflect the fact that during a collision, passengers come into contact with the lower structure of the motor vehicle (windshield, dashboard, seats). Although we have no data on the wearing of seat belts, the frequency of injuries to the face and head leads us to believe that the rate of utilization of the seat belt was quite low at that time. It must be remembered that wearing a seat belt was not compulsory in Quebec in 1974 (the law came into effect in Quebec in August 1976).

Non-occupants of automobiles are subject to more severe injury risks given that they have no protection during a collision or a skid. Their bodies often come into direct contact with a motor vehicle, and moreover, the possibilities of being thrown are more likely than for automobile occupants.

Their injury profile reflects these phenomena by showing a high rate of injuries to the extremities which are the most exposed parts of the body in non-occupants of automobiles (fractures of the femur, common in pedestrians, clearly indicate this fact).

The analysis of injury severity for different categories of road users did not clarify really significant differences when either of the following was used: the average severity of all injuries (AIS) or the average severity of three of the most severe injuries for each victim (ISS).

However, when victims are characterized by the most severe injury, pedestrians and motorcyclists are significantly in greater evidence than automobile drivers and passengers. It must be mentioned that classification of road accident victims according to injury severity depends on the index chosen for measuring the severity. For example, motorcyclists are affected by injuries in a smaller number of body regions than certain other categories of road users (eg. cyclists, automobiles occupants). This results in their appearing to be less injured than in reality (according to the ISS index), considering the number of regions injured added to the severity of injuries sustained in these parts of the body. We are confident of the ISS index as an indicator of severity, when we examine the average ISS and the length of the treatment period as indicated in table 40.

In consequence, the results obtained by using the different injury severity indices, have to be carefully interpreted. Finding out which of the severity indices is the most revealing, depends on the aims pursued by the researchers. There is no doubt that the diversity of situations concerning different categories of road users requires subtlety in comparing injuries sustained by them.

We were also interested in the results of road accidents in terms of the consumption of medical and hospital services attributable to individuals injured on the road. We considered, first of all, the heavy load represented by an in-patient as opposed to an out-patient victim. We also noticed that certain road users consume more medical and hospital services than others. This might be the result of many factors.

TABLE 40

Mean ISS in relation to period of treatment of injured treated both in hospital and as out-patients.

Treatment Period	Hospitalized		Out-patients	
	Mean ISS	Standard deviation	Mean ISS	Standard deviation
1 day	18.30	15.48	3.23	3.27
2- 7 days	6.01	5.18	2.44	1.74
8- 14 days	9.90	6.88	2.51	3.18
2- 8 weeks	8.34	5.82	3.17	1.80
8- 26 weeks	10.43	6.33	4.07	3.02
26- 52 weeks	11.42	6.17	4.00	2.79
52 weeks or more	13.04	6.99	5.00	5.36
Total	10.08	6.81	3.20	2.80

Pedestrians tend to stay longer in hospital than other categories of road users. However, this phenomenon does not only reflect the severity of their injuries. It must be remembered that pedestrians are mainly a very young age group (5-15 year) or are very old (60 year and over). Therefore we are dealing with victims for whom road accident injuries have important consequences and who require special attention. The age factor will contribute to increasing the severity of injuries sustained. Bull of Birmingham proved this, and our previous studies also indicated this phenomenon. It would perhaps be opportune to refine the ISS indicator with an age factor.

Age is not the only factor that can influence the length of medical treatment required following a road accident; gender and the victim's previous state of health play an important role. Moreover, the type of injury is a determining factor in the treatment received by a category of victims. Motorcyclists are distinguished by a relatively longer period of treatment than other categories of road users. It is not surprising then that the nature of their injuries (multiple fractures of the limbs) have a bearing on this phenomenon. Although their injuries do not, on average, threaten their survival, they imply continued medical follow-up, and can result in more or less permanent disabilities.

Other injuries (internal head, chest or abdomen injuries) can present, at the time of the accident, a greater threat to the victim's survival, but if they are properly treated, the recovery period will be relatively short. Hence the importance of primary care on site, during transportation or at the emergency department. If there is a field where curative medicine is efficient, and cannot be challenged, it is in the area of treatment for road accident victims.

If Ivan Illich invalidated curative medicine, then Thomas McKeown questioned this stance at least with respect to traumatology.

Certain road users still incur higher direct costs. An in-patient pedestrian costs about twice as much as an in-patient cyclist and one and a half times more than an in-patient automobile occupant. Distributing the victims according to the category of road users influences total direct costs.

By examining the rates of mortality of all Quebec road accident victims on a parallel with the ISS index of severity in our sample, we found that there was a higher fatality ratio for pedestrians for the different categories of road accident victims and especially for pedestrians (table 41). This is also shown by the average ISS index for in-patient and out-patient victims. Since we have no deaths on the accident site in our sample, the sample's fatality ratio was not useful.

Hence the obviously high 1974 mortality rate for pedestrians in Quebec and the whole of Canada, corroborates the higher morbidity obtained in our sample by using the ISS indicator. This may correspond to a real situation: pedestrians involved in accidents die more frequently and they are more severely injured than any other category of road users.

These results suggest new areas of research, and in this respect its worth drawing attention to non-occupants of motor vehicles and in particular pedestrians. This category of road users is subjected to especially severe injury risks and generates high direct costs (in terms of medical and hospital services). Moreover, possibilities of intervention at the level of preventing pedestrian accidents still seem to be very great.

This does not imply that it is no longer possible to intervene in order to forecast injuries sustained by automobile occupants who accounted for 70% of road deaths and 80% of injuries in 1974. We believe that the main practical safety measures influencing frequency and severity of injuries sustained by automobile occupants, have been taken by making the wearing of the seat belt compulsory - provided people wear them regularly - and by decreasing the speed limit on Quebec roads. (These two measures have been legally compulsory since August 1976 in Quebec). Now perhaps we will consider decreasing the use of the motor vehicle in the cities!

TABLE 41

Fatality ratio of road crash victims in Canada and in Quebec in 1974 and mean ISS of the sample.

Road users	No. of fatalities Quebec	Canada	No. of casualities Quebec	Canada	Fatality ratio Quebec %	Canada %	Mean ISS (sample) Hosp. vict.	Non-hosp. vict.
Drivers	615	2529	18037	101202	3.4	2.5	10.01	3.07
Passengers	456	1854	18545	88847	2.4	2.1	9.80	2.99
Pedestrians	367	1115	7646	20986	4.8	5.3	11.09	4.41
Cyclists	84	182	3329	8728	2.5	2.1	9.19	3.64
Motorcyclists	151	360	5183	12405	3	3	(driver)9.43 (pass) 9.2	3.46 2.46
Together	1882	6290	55961	235931	3.3	2.6	10.	3.2
Our sample	22		1008		2.1			

OBJECTIVE IV:

Analysis of a few characteristics pertaining to the victim/motor vehicle/environment with data coming from record linkage

Objective IV Analysis of a few characteristics pertaining to the victim/motor vehicle/environment with data from record linkage

1. INTRODUCTION

In our sample each of the victims was characterized by a series of four main types of variables: demographic variables (age, sex, marital status), variables related to injuries (nature, severity, number of body regions), variables related to care received (hospital stay, length of treatment, cost of treatment) and variables related to the accident circumstances (nature of the collision, rural or urban, speed limit, year of the motor vehicle, type of vehicle).

In order to carry out the analysis of these data, several methods can be chosen, from the examination of crossed tabulations to utilization of multidimensional methods.

2. PROFILE OF ACCIDENTS BY CATEGORY OF ROAD USERS

An examination of crossed tables allows us to point out dominant characteristics of road crashes and victims in tables 47 to 56, separating drivers from passengers, pedestrians and motor cyclists.

90% of pedestrian accidents occur in an urban area, compared to 51% for automobile accidents with collisions (tables 42 and 47). 82% of automobile crashes without collisions take place in 60 m.p.h. (56%) and 50 m.p.h. (26%) speed limit zones (table 43), whereas for other types of accidents this ratio differs: table 42 shows that 45% of car crashes with collision occur in a 30 m.p.h. speed limit zone.

Half of the cyclists injured are between 10 and 15 years of age, 87% being less than 20 years old.

In our sample, 51% of pedestrian accidents occur in the daytime, and 56% of the victims are men. This result contrasts with Simpson's who studied the pedestrian deaths in relation to Breath analyser tests and concludes that 80% of these accidents occur at night with 79% of the cases involving men. It might mean that the death pattern differs from the injured car crash pattern at least for pedestrians.

An analysis by category of road users has not been done with the official data published either by the provinces, or by Statistics Canada. We are convinced that this relatively simple variable needs to be isolated and published in separate tables. It would reveal tendencies and pointers to be investigated further.

TABLE 42

Profile of automobile accidents with collision

VARIABLES STUDIED	DOMINANT CHARACTERISTICS absolute frequency	
A. CHARACTERISTICS OF THE ENVIRONMENT		
1. Month of the accident	September to November	36%
	October	14%
2. Day of the week	Friday to Sunday	59%
	Saturday	23%
3. Time of day	16h00 to 24h00	48%
	16h00	8%
4. Nature of the collision	side	48%
	head-on	34%
	back	17%
5. Region	Montreal- metropolitan	24%
	Quebec	17%
6. Type of region	urban	51%
7. Localization	between intersections	47%
	intersections	41%
8. Type of road	two-way road	40%
	city roads	36%
	highways	6%
9. State of the surface	dry	64%
	wet	24%
	snowy-icy	12%
10. Nature of the surface	asphalt	93%
11. Aspect of the surface	flat-straight	66%
	incline-straight	15%
12. Weather	clear	58%
	rain	14%
13. Light	day	47%
	night (lighted road)	27%
	night (non-lighted road)	17%
14. Speed limit	30 m.p.h.	45%
	more than 60 m.p.h.	31%

TABLE 43

PROFILE OF AUTOMOBILE ACCIDENTS WITHOUT COLLISION

VARIABLES STUDIED	DOMINANT CHARACTERISTICS Absolute frequency	
A. CHARACTERISTICS OF THE ENVIRONMENT		
1. Month of the accident	July to September	47%
	July	22%
2. Day of the week	Friday to Sunday	66%
	Friday	26%
3. Time of day	21h00 to 24h00	35%
4. Nature of the collision	not applicable	
5. Region	Montreals' south shore	24%
	Quebec	22%
	Saguenay-Lac St-Jean	10%
	Metropolitan Montreal	2%
6. Type of region	rural (secondary roads)	43%
	rural (main roads)	40%
7. Localization	between intersections	74%
	intersections	12%
8. Type of road	two-way road	75%
	highways	11%
9. State of the surface	dry	75%
	wet	14%
	snowy-icy	9%
10. Nature of the surface	asphalt	97%
11. Type of surface	flat-curve	39%
	hill-curve	25%
	hill-straight	7%
12. Weather	clear	63%
	rain-snow	21%
13. Light	day	37%
	night (road not lighted)	36%
	twilight	10%
14. Speed limit	50 m.p.h.	26%
	more than 60 m.p.h.	56%

TABLE 44

AUTOMOBILE ACCIDENTS WITH OR WITHOUT COLLISION

VARIABLES STUDIED	DOMINANT CHARACTERISTICS absolute frequency	
B. CHARACTERISTICS OF VEHICLES		
1. Number of vehicles involved	with collision : two	76%
	without collision: one	98%
2. Type of vehicle	automobile	88%
	truck	9%
3. Year	before 1970	38%
	1965 - 1969	32%
4. Movement of vehicles	drive straight	74%
	left turn	9%
5. Number of occupants	one	48%
	two, three	41%
C. CHARACTERISTICS OF THE DRIVERS		
1. Number of drivers involved	with collision : two	77%
	without collision: one	100%
2. Sex of drivers	male	88%
3. Age of drivers	20 - 34 years	53%
4. Driving experience	more than 7 years	58%
5. Restrictions to driving	none	79%
	glasses	17%

TABLE 45

DRIVERS (ACCIDENTS WITH OR WITHOUT COLLISION)

VARIABLES STUDIED	DOMINANT CHARACTERISTICS (absolute or average frequency)		
D. CHARACTERISTICS OF VICTIMS (1)			
1. Age	20 - 34 years		50%
2. Sex	male		78%
3. Occupation	high/middle management/ specialized worker		52%
4. Marital status	married		54%
E. CHARACTERISTICS OF INJURIES		NH(2)	H(3)
1. Number of injuries sustained	average	1.6	2.5
2. Nature of the injuries	lacerations	31%	19%
	sprain, dislocation	24%	5%
	fractures	13%	42%
3. Number of parts of the body affected	average	1.4	1.8
4. Part of the body	head-neck	35%	25%
	face	28%	22%
	limbs	18%	27%
5. Severity of injuries:			
*Average AIS of all injuries	average	1.4	2.1
Average AIS of the most severe injury	average	1.5	2.6
**ISS average	average	3.1	10.0
F. CHARACTERISTICS OF MEDICAL AND HOSPITAL CARE			
1. Number of hospitalizations	average	--	1.3
2. Total hospital stay (days)	average	--	16.2
3. Visits to the out-patient department	average	2.5	2.8
4. Visits to physician's office	average	3.9	2.0
5. Number of medical services	average	14.2	20.8
6. Total duration of treatment (days)	average	56.8	155.1
7. Total cost of treatment ($)	average	142	1890

(1) Victims of the sample
(2) NH = non hospitalized victim
(3) H = hospitalized victim

* AIS = 1,2,3,4,5 or 6

** $ISS = \sum_{i=1}^{3} (AIS)_i^2$

TABLE 46

PASSENGERS (ACCIDENTS WITH OR WITHOUT COLLISION)

VARIABLES STUDIED	DOMINANT CHARACTERISTICS (absolute or average frequency)		
D. CHARACTERISTICS OF VICTIMS (1)			
1. Age	15-34 years 15-19 years		53% 24%
2. Sex	female		58%
3. Occupation	student housewife unskilled worker		29% 17% 10%
4. Marital status	single		60%
E. CHARACTERISTICS OF THE INJURIES		NH(2)	H(3)
1. Number of injuries sustained	average	1.6	2.4
2. Nature of injuries	lacerations contusions fractures	28% 25% 19%	16% 15% 42%
3. Number of regions affected	average	1.4	1.8
4. Body region	face limbs head-neck	38% 28% 21%	25% 30% 21%
5. Injury severity:			
*Average AIS of all injuries	average	1.4	2.1
Average AIS of the severest injury	average	1.5	2.6
*Average ISS	average	3.0	9.8
F. CHARACTERISTICS OF MEDICAL AND HOSPITAL CARE			
1. Number of hospitalizations	average	--	1.3
2. Total in-patient stay (days)	average	--	19.8
3. Visits to out-patient clinic	average	2.9	2.4
4. Visits to physician's office	average	0.9	1.6
5. Number of medical procedures	average	7.0	19.3
6. Total length of treatment (days)	average	44.6	130.8
7. Total cost of treatment ($)	average	107	2103

---

(1) Victims from the sample

(2) NH: out-patient (3) H: in-patient

* AIS: 1,2,3,4,5 or 6 **ISS: $\sum_{i=1}^{3} (AIS)_i^2$

TABLE 47

PROFILE OF PEDESTRIAN ACCIDENTS

VARIABLES STUDIED	DOMINANT CHARACTERISTICS (absolute frequency)	
A. CHARACTERISTICS OF THE ENVIRONMENT		
1. Month of the accident	October to December October	34% 13%
2. Day of the week	Friday-Saturday Friday	35% 20%
3. Time of day	11h00 to 21h00 16h00 to 19h00	71% 28%
4. Nature of collision	not applicable	
5. Region	metropolitan Montreal	51%
6. Type of region	urban	90%
7. Site	between intersections intersections	63% 30%
8. Category of road	city roads	79%
9. State of the surface	dry wet	62% 23%
10. Nature of the surface	asphalt	99%
11. Aspect of the surface	flat-straight	87%
12. Weather	clear rain	65% 12%
13. Light	day night (lighted road)	51% 30%
14. Speed limit	30 m.p.h.	82%

TABLE 48

PEDESTRIAN ACCIDENTS

VARIABLES STUDIED	DOMINANT CHARACTERISTICS (absolute frequency)	
B. CHARACTERISTICS OF MOTOR VEHICLES		
1. Number of vehicles involved	one	92%
2. Type of vehicle	automobile truck	83% 8%
3. Year of the vehicle	1965-1969	32%
4. Movement of vehicles	straight ahead	85%
5. Number of occupants	one	84%
C. CHARACTERISTICS OF DRIVERS		
1. Number of drivers involved	one	95%
2. Sex of the drivers	male	85%
3. Age of the drivers	20-34 years	48%
4. Driving experience	more than 7 years 7-19 years	63% 34%
5. Restriction to driving	none glasses	75% 22%

TABLE 49
PEDESTRIANS

VARIABLES STUDIED	DOMINANT CHARACTERISTICS (absolute or average frequency)		
D. CHARACTERISTICS OF VICTIMS (1)			
1. Age	0-14 years		37%
	55 years and more		20%
2. Sex	male		56%
3. Occupation	student		43%
	retired		15%
4. Marital status	single		66%
E. CHARACTERISTICS OF INJURIES		NH(2)	H(3)
1. Number of injuries sustained	average	1.7	2.3
2. Nature of the injuries	fractures	23%	50%
	contusions	29%	17%
	concussion	10%	11%
3. Number of regions affected	average	1.5	1.6
4. Body region	limbs	51%	48%
	Head-neck	19%	24%
	Face	21%	9%
5. Injury severity:			
*Average AIS of all injuries	average	1.5	2.3
Average AIS of the severest injury	average	1.8	2.8
*Average ISS	average	4.4	11.1
F. CHARACTERISTICS OF MEDICAL AND HOSPITAL CARE			
1. Number of hospitalizations	average	--	1.4
2. Total hospital stay (days)	average	--	31.3
3. Visits to out-patient clinic	average	3.1	2.5
4. Visits to physician's office	average	1.8	2.3
5. Number of medical procedures	average	8.0	28.3
6. Total length of treatment (days)	average	55.9	152.5
7. Total cost of treatment ($)	average	117	3163

(1) Victims of the sample

(2) NH: out-patient victim

(3) H: in-patient victim

* AIS: 1,2,3,4,5 or 6

** ISS: $\sum_{i=1}^{3} (AIS)_i^2$

TABLE 50

ACCIDENT PROFILE FOR BICYCLES

VARIABLES STUDIED	DOMINANT CHARACTERISTICS (absolute frequency)	
A. CHARACTERISTICS OF THE ENVIRONMENT		
1. Month of the accident	June to August	72%
	June	26%
2. Day of the week	Thursday-Friday	42%
3. Time of day	16h00 to 18h00	31%
	18h00 to 23h00	27%
4. Nature of collision	not applicable	
5. Region	Montreal metropolitan	23%
6. Type of region	urban	68%
7. Localization	between intersections	65%
	intersections	25%
8. Type of road	city roads	58%
	two-ways roads	27%
9. State of the surface	dry	86%
	wet	14%
10. Nature of the surface	asphalt	94%
11. Aspect of the surface	flat-straight	73%
	hill-curve	20%
12. Weather	clear	77%
	rain	4%
13. Light	day	71%
	night (non lighted)	12%
14. Speed limit	30 m.p.h.	60%
	more than 60 m.p.h.	26%

TABLE 51

CYCLISTS

VARIABLES STUDIED	DOMINANT CHARACTERISTICS (absolute or average frequency)		
D. CHARACTERISTICS OF VICTIMS (1)			
1. Age	0-19 years		87%
	10-14 years		49%
2. Sex	male		72%
3. Occupation	student		86%
4. Marital status	single		92%
E. CHARACTERISTICS OF INJURIES		NH(2)	H(3)
1. Number of injuries sustained	average	2.0	2.6
2. Nature of injuries	simple fractures	36%	31%
	open fractures	--	15%
	concussions	--	17%
3. Number of parts of the body affected	average	1.5	1.8
4. Part of the body	limbs	38%	43%
	face	31%	17%
	head-neck	13%	30%
5. Severity of injuries:			
*Average AIS of all injuries	average	1.5	2.1
Average AIS of the most severe injury	average	1.6	2.5
**ISS average	average	3.6	9.2
F. CHARACTERISTICS OF MEDICAL AND HOSPITAL CARE			
1. Number of hospitalizations	average	--	1.2
2. Total hospital stay (days)	average	--	17.7
3. Visits to the out-patient department	average	3.2	2.4
4. Visits to the physician's office	average	2.7	0.7
5. Number of medical services	average	12.2	13.8
6. Total duration of treatment (days)	average	117.9	150.7
7. Total cost of treatment ($)	average	154	1677

(1) Victims of the sample
(2) NH = non-hospitalized victim
(3) H = hospitalized victim

* AIS = 1,2,3,4,5 or 6

** $ISS = \sum_{i=1}^{3} (AIS)_i^2$

TABLE 52

BICYCLE ACCIDENTS

VARIABLES STUDIED	DOMINANT CHARACTERISTICS (absolute frequency)	
B. CHARACTERISTICS OF THE VEHICLES		
1. Number of vehicles involved	one	100%
2. Type of vehicle	automobile	68%
	truck	15%
3. Year	1972-1975	49%
	1965-1969	26%
4. Movement of vehicles	straight ahead	85%
5. Number of occupants	one	86%
C. CHARACTERISTICS OF DRIVERS		
1. Number of drivers involved	one	100%
2. Drivers' sex	masculine	92%
3. Drivers' age	15-24 years	31%
	25-34 years	43%
4. Drivers' experience	7-19 years	48%
	1- 3 years	20%
5. Restriction to driving	none	85%
	glasses	13%

TABLE 53

PROFILE OF MOTORCYCLE ACCIDENTS

VARIABLES STUDIED	DOMINANT CHARACTERISTICS (absolute frequency)	
A. CHARACTERISTICS OF THE ENVIRONMENT		
1. Month of the accident	May to August	71%
	July	22%
2. Day of the week	Friday to Sunday	51%
	Sunday	22%
3. Time of day	13h00 to 19h00	51%
	16h00 to 17h00	11%
4. Nature of the collision	side	68%
5. Region	Montreal metropolitan	25%
	Montreal's south shore	15%
6. Type of region	urban	81%
	city roads	64%
7. Localization	intersections	56%
8. Type of road	city roads	64%
	two-ways roads	22%
9. State of the surface	dry	87%
	wet	12%
10. Nature of the surface	asphalt	95%
11. Aspect of the surface	flat-straight	78%
12. Weather	clear	76%
13. Light	day	57%
	night (lighted road)	32%
14. Speed limit	30 m.p.h.	75%
	60 m.p.h.	10%

TABLE 54

MOTORCYCLE ACCIDENTS

VARIABLES STUDIED	DOMINANT CHARACTERISTICS (absolute frequency)	
B. CHARACTERISTICS OF VEHICLES		
1. Number of vehicles involved	two	87%
2. Type of vehicle	automobile	42%
	motorcycle	51%
3. Year of vehicle	1972-1975	64%
	1972-1973	41%
4. Movement of vehicles	straight ahead	57%
	left turn	27%
5. Number of occupants	one	71%
	two	25%
C. CHARACTERISTICS OF DRIVERS		
1. Number of drivers involved	two	89%
2. Sex	male	87%
3. Drivers' age	15-24 years	55%
	15-19 years	31%
4. Driving experience	1 to 3 years	36%
5. Restriction to driving	none	73%
	glasses	15%

TABLE 55
MOTOCYCLISTS

VARIABLES STUDIED	DOMINANT CHARACTERISTICS (absolute or average frequency)		
D. CHARACTERISTICS OF THE VICTIMS (1)			
1. Age	15-24 years 15-19 years		84% 59%
2. Sex	male		83%
3. Occupation	student unskilled worker/ labourer		39% 20%
4. Marital status	single		93%
E. CHARACTERISTICS OF INJURIES		NH(2)	H(3)
1. Number of injuries sustained	average	1.4	2.4
2. Nature of injuries	simple fracture	36%	28%
	open fracture...	--	30%
	contusions	30%	10%
	lacerations	16%	8%
3. Number of parts of the body affected	average	1.1	1.5
4. Part of the body	limbs	71%	62%
	head-neck	8%	13%
5. Severity of injuries:			
*Average AIS of all injuries	average	1.6	2.2
Average AIS of the severest injury	average	1.7	2.8
**ISS average	average	3.3	9.4
F. CHARACTERISTICS OF MEDICAL AND HOSPITAL CARE			
1. Number of hospitalizations	average	--	1.6
2. Total hospital stay (days)	average	--	23.7
3. Visits to the out-patient department	average	2.4	4.7
4. Visits to the physician's office	average	0.5	2.1
5. Number of medical services	average	4.4	23.8
6. Total duration of treatment (days)	average	27.7	246.3
7. Total cost of treatment ($)	average	80	2772

(1) Victims of the sample
(2) NH = non-hospitalized victim
(3) H = hospitalized victim

* AIS = 1,2,3,4,5 or 6

** $ISS = \sum_{i=1}^{3} (AIS)_i^2$

3. MULTIDIMENSIONAL ANALYSIS: APPLICATION OF THE FACTORIAL ANALYSIS OF CORRESPONDENCES TO DATA ON ROAD ACCIDENT VICTIMS (BENZECRI'S METHOD)

Crossed tabulations lead us to make a priori choices about relationships between different variables. To eliminate this constraint, we opted for a method allowing us to discover the structural facts contained in our data bank, i.e. a method describing our data as a whole while showing the similarities (profiles) and structures underlying these data.

From the wide range of methods of analysing data, we chose the factorial analysis of correspondences, a branch of factorial analysis (descriptive factorial analysis). This method has been used in demography (Boyer et Caillot, in their analysis of death causes, Tabah in his studies on fertility), and in road accident studies (Biecheler, M.B. and Marchal, B.); its use in this pilot descriptive study corresponds to our fourth objective and has the advantage of offering clear rules of interpretation.

a) General principles of the method

The aim of the method, as applied to our data, is to bring out parallels between the circumstances of a road accident, the injuries sustained, the treatment received and the victims' demographic characteristics. A contingency table is used, with the rows indicating the different victims (identified numerically) and the columns representing the various characteristics associated with these victims. (Variables identified by a four-figure set of initials).

We note that each of our original variables has been transformed into a dichotomous sub-variable. In fact, the correspondence analysis method, like all classical multivariate methods, requires homogeneous data. Our original variables, being metric variables in some cases and ordinate variables in others, had to be transformed into sub-variables (corresponding to the variable categories) presenting the same structure. Thus, for a given sub-variable, individuals can only have two values 0 or 1, the table representing these binary data being an incidence table. From the mathematical point of view, a data table of this kind (disjunctive) provides results equivalent to those arising from a true contingency table.

This rectangular data table with i lines (individuals) and j columns (sub-variables) can be represented by points in a space with i or j dimensions. The i lines of the table will be represented by i points of a space with j dimensions. Between these points it is possible, according to the Chi squared formula, to evaluate distances chosen in such a way as to describe the similarities between these lines. We are aiming to achieve a plane graph, a cluster diagram image of i dimensions: this graph is the best two-dimensional subspace (in accordance with the adjustment criterion) that can reconstruct proximities between points.

Our sets of individuals (I) or variables (J) are thus drawn by a point cluster diagram in a Euclidean space with the metrical configuration Chi 2. The main axes of inertia are determined for it, and a factor is associated with each axis. The extraction of two factors represents the set i and simultaneously the set J in diagrammatic form. This allows the significant dependency between elements fo i or j to be revealed.

Three different analyses were made on two groups of victims, differentiated by their category of road-user, automobile drivers and pedestrians. The first analysis deals with drivers of automobiles only, the second is related to both drivers and pedestrians whereas the third is carried out only on pedestrians. Table 56 describes the components of each of these analyses.

TABLE 56

Description of the Factorial Analyses of Correspondences

Number of analysis	Category of victims	Numbers	Number of Variables	Number of Sub-variables	Figures
1	automobile drivers	258	16	78	1: axes 1 and 2 individuals 2: axes 1 and 2 sub-variables
2	pedestrians and automobile drivers	447	17	88	3: axes 1 and 2 individuals 4: axes 1 and 2 sub-variables
3	pedestrians	188	27	115	5: axes 1 and 2 sub-variables 6: axes 2 and 3 sub-variables

b) First analysis: automobile drivers

i) Data presentation

Data were taken from our sample of automobile drivers (I: 258) for whom the 16 most feasible variables were used to clarify the relationships between accident circumstances, injuries sustained, care received and the victim's characteristics.

These 16 variables were distributed in the following way: two demographic variables (age, victim's sex), 6 variables related to accident circumstances (severity, nature of the collision, region, vehicle, speed), five variables related to injuries (severity, number, body regions) and 3 variables related to care received (length and treatment cost). After transformation of the data, 78 sub-variables were obtained (see Appendix VI, article 2, p. 274 and pp. 146-147 of this section. The correspondence analysis operates from a rectangular table of 258 rows and 78 columns.

ii) Results and interpretation

Significance of the first factors

For drivers, the first two axes of the analysis account for 13% of the total inertia (8% and 5% respectively for the first and second axes). A large dispersion is observed in the percentage of total inertia among the successive factors: it is only with 16 factors that 5% of the total inertia is obtained.(1)

---

(1) The reader who is familiar with the methods of regression analysis may be surprised at the low percentage of explanation for the first factor. It must be stressed that because of the method itself (which is different from regression analysis) and the transformation undergone by our basic variables, the measure obtained for the percentage of explanation of the total inertia is greatly underestimated. (Lebart, L., Morineau, A. and Tabah).

Nevertheless, with the survey data, we can arrive at an initial factor that is perfectly valid when the percentage of total inertia given by this factor gravitates around 10%. In our case, the first factor reaches 8% and the first two factors are visibly different from the others, reflecting a real data structure.

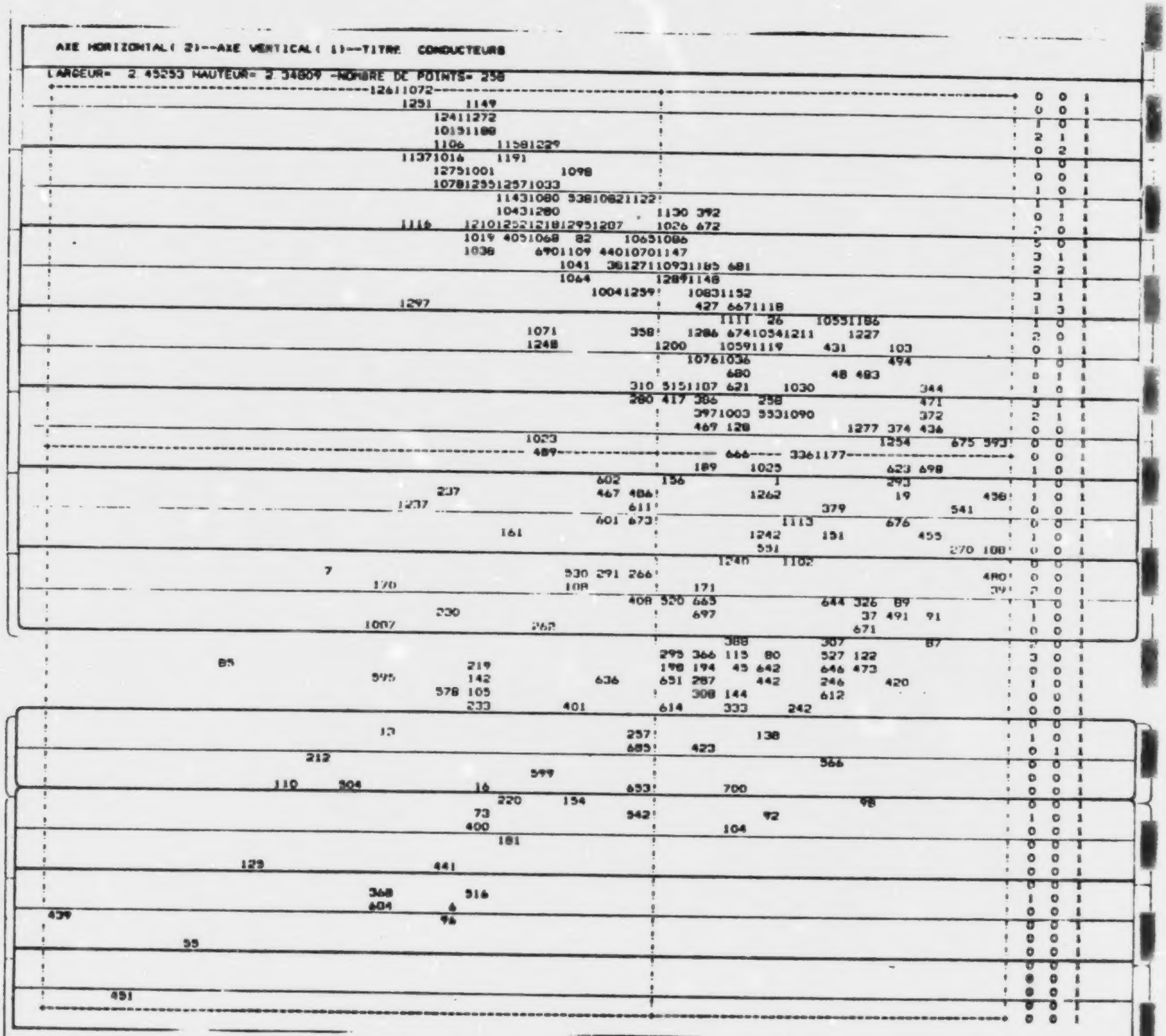
Figure 4 shows that drivers identified by a number are distributed along the first axis. The first factor reflects the general severity level of an accident. It is noted that the order of the different severity indices is accurately repeated. As a result the categories (ISS 1 to ISS 8) of the ISS variable vary in order along the first axis (Fig. 4). The same is true for other variables measuring a certain accident or injury severity. The number of injuries (NBB), the number of body regions (NBR), the part of the body afflicted (REG), in-patient hospital stay (SEJ), length of treatment (DUR) and treatment cost (CTT). These variables are clearly the most discriminant, because their different categories are the most extended along the first axis.

Moreover, the first axis definitely contrasts in-patient drivers (codes 0 to 999) to out-patient drivers (codes 1001 to 2000) (Fig. 4). In fact, the point images of drivers are arranged along the first axis in a logical manner, thus allowing for a clear interpretation: separating the slightly injured drivers from the severely injured. The distribution however is asymmetric; points associated with greater severity are further from the centre of distribution than the opposing points. This indicates the more exceptional nature of characteristics associated with the most severe accidents.

The second factor is a parabolic function of the first: it follows the same pattern as the first, with certain subtle differences that can be interpreted. It emphasizes the most distant points and

FIGURE 4

Drivers. Plan 1 x 2 output of the analysis of correspondences.
Point-images of 258 victims .



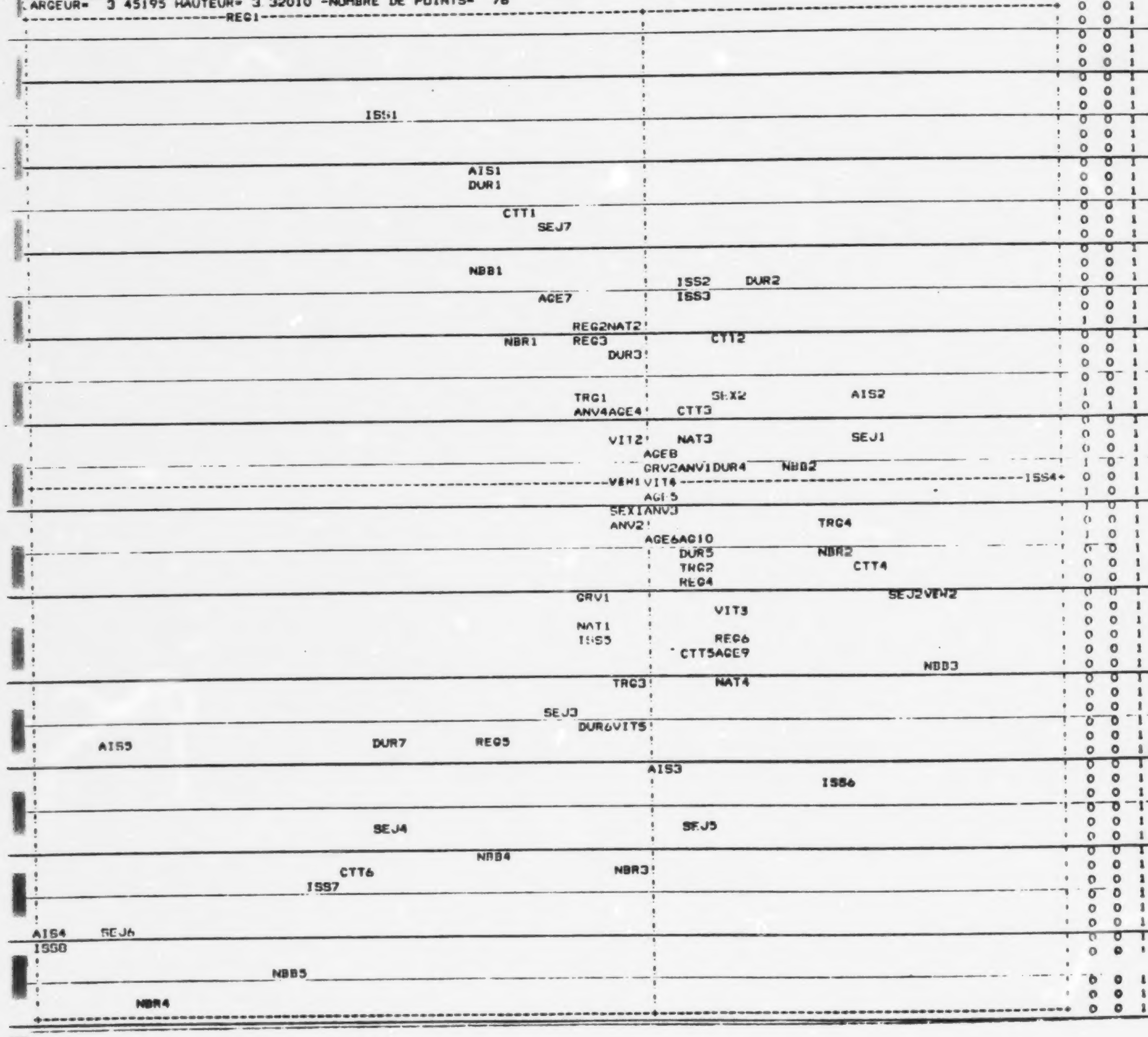
Note: Codes 0 TO 999 : hospitalized drivers
Codes 1000 TO 1999 : non hospitalized drivers

FIGURE 5

Drivers. Plan 1 x 2 computer output of the correspondence analysis. Point-images of 78 sub-variables.

AXE HORIZONTAL(2)--AXE VERTICAL(1)--TITRE CONDUCTEURS

LARGEUR= 3 45195 HAUTEUR= 3 32010 -NOMBRE DE POINTS= 78



Note : See pages 146-147 for the meaning of the codes contrasts drivers who sustain very severe or very mild injuries with those sustaining injuries of average severity.

Analysis of the proximities between variables

It is interesting to note that the first axis gives a very clear connotation - the hierarchy of variables parallel to this axis should be noted. One might query whether these are variables for which the categories correspond to average driving conditions or to contrasting conditions favorable to a crash.

Variables related to accident circumstances

The nature of the collision seems important in determining accident severity; frontal collisions (NAT 1), skids and overturning are negative factors associated with more severe accidents whereas rear collisions (NAT 2) and side collisions are situated on the positive side.

The authorized speed limit is not very discriminant except for roads where the limit is between 50 and 60 m.p.h. (VIT 4): the factor is then a negative one. This variable greatly overlaps the type of region where the accident occurred; thus the urban region (TRG 1) has a positive value whereas the rural region (TRG 3) (mainly the secondary road where the speed limit varies from 50 to 60 m.p.h.) shows a negative value.

The type of motor vehicle, as well as the model (YEAR ANV) have values slightly distant from the center, and do not seem to be associated with an accident type.

The first factor therefore, contrasts two types of accidents: 1) the urban accident, occuring exclusively in an urban area, in a zone where the speed limit is less than 30 m.p.h., and resulting from a rear or side collision, 2) the rural accident taking place on secondary roads where the speed limit is between 50 and 60 m.p.h. and resulting in a frontal collision.

Demographic variables

The variable "age" is often mentioned as an important variable in relation to the severity of injuries sustained during an accident. The oldest age groups (55-64 years and 65 years and over) (AGE 9 and AGE 10) have negative values and are related to the indices of the most severe injuries: older victims are more severely injured and needed longer lasting medical care. On the other hand, the age group 35-44 years has a positive value on the severity axis: it is associated with minor injuries and the urban type of accident.

The other age groups are less discriminant with respect to accident severity. For sex the following result would need further verification: the male sex has a negative value (although weak) whereas the female sex has a positive value linking minor injuries to the urban type of accident.

Variables related to injuries

It has already been mentioned that in relation to the number of injuries sustained (NBB), the number of body regions injured, the AIS index(1) and the ISS index, the categories for each of these variables increase along the first axis, giving the axis its clear connotation.

---

(1) It must be remembered that this profile of injury severity according to the body region does not affect victims who die on accident sites, since they are not included in our sample.

As for the part of the body injured, this has special meaning for a driver, given his position in a motor vehicle. The most severely injured regions are the abdomen, (REG 5) limbs (REG 6) and chest (REG 4) whereas the general body regions, head-neck and face (REG 1, REG 2, REG 3) are associated with less severity.(1)

These statements suggest the following interpretation: the driver of an automobile would be exposed by virtue of his position inside the vehicle, to sustaining injuries in three regions: head-neck and face, limbs and chest-abdomen. It seems that the more severe the accident (frontal rather than rear or side collision), the greater the parts of the body affected. A simple rear or side collision in an urban setting would possibly produce an injury to the head-neck region (lacerations to the head, cervical sprain) or face (lacerations or contusions to the face caused by contact with the windshield); a frontal collision or a skid in a rural area would also produce injuries at the first level (head, neck and face); injuries to limbs (sprains, fractures) and possibly injuries to the chest region (rib fractures, haemothorax) and abdomen (rupture of the spleen, intestinal perforation caused possibly by contact with the steering wheel or the dashboard).

iii) Conclusion of the first analysis: Drivers

The correspondence analysis method therefore clarifies some very interesting structural facts about automobile drivers. In addition to distinguishing adequately between in-patient and out-patient victims, the method also showed two multidimensional accident profiles for injured drivers.

---

(1) It must be remembered that this profile of the injury severity according to the body region does not affect victims who die on accident sites, not included in our sample.

The first factor absorbs 7.2% of the total inertia. This percentage is 64 times higher than it would be if the variables were independent. There are therefore certain links between the variables and an extension of point - individuals along this first axis.

The first axis is still interpreted as an axis for the accident severity level. It clearly distinguishes the less injured from the more injured victims. Figure 6 presents 2 clusters of points-individuals in lunar form, that are quite distinct and almost parallel: a first cluster (on the right) corresponds to drivers (in-patient drivers are identified by a number between 0 and 999 and out-patients by a number varying from 1 000 to 1 999). The second cluster (on the left) corresponds to pedestrians (in-patient pedestrians are coded from 2 000 to 2 999 and out-patients are coded at between 3 000 and 3 999).

It would seem therefore that given the connotation of the first factor, drivers would be less severely injured than pedestrians, and this equally for in-patient as well as for out-patient victims. It is to be noted that the scattering of point - individuals is less pronounced for pedestrians (which would conform more closely to an accident model) than for drivers. We are dealing with a comprehensive judgment on severity attributed to each category of user where we consider, not only the injuries sustained but also the care required and the length of treatment, all of which are independent of the injuries. Other variables (age, sex, former physical condition) also intervene. Here, we can see the advantage of the analytic method again, in so far as it allows a multidimensional judgement corresponding to the very nature of a road accident.

In this second analysis, the second factor which absorbs 5.3% of the total inertia, is quite clearly interpretable. It seems to correspond to a gradation of speed limits (VIT 1 to VIT 5) and

URBAN TYPE OF ACCIDENT: Urban area
Rear Collision
Speed Limit below 30 m.p.h.
Victim aged 35-44 (year) - Female
Recent Model Vehicle
Minor Injuries to the Head-Neck and Face
Out-patient Victim

RURAL TYPE OF ACCIDENT: Rural Setting - Secondary Roads
Frontal Collision, Skid or Overturning
Speed Limit 50-60 m.p.h.
Victim aged 55 years and more - Male
Severe Injuries to Limb, Abdomen or Chest
In-patient Victim

c) Second analysis: Automobile Drivers and Pedestrians

The second application of the method is aimed at comparing two categories of road users whose characteristics present certain differences.

i) Data Presentation

Our sample comprises 258 drivers and 189 pedestrians.

The analysis will be based on 447 individuals on whom we have used 17 variables which, after polychotomization, give 88 subvariables. This involves 16 variables from the first analysis to which is added the variable "type of injuries" (see pp. 146-7 for Variable Codes).

ii) Results and Interpretation

Significance of the First Factors

The results are not very different from the first analysis with respect to the percentage inertia absorbed by the first factors.

underlying this gradation, to the contrast between an urban and rural accident (Figure 6).

The pedestrians' accident is an urban type of accident: the variables TRG 1 (urban region) and VIT (speed below 30 m.p.h.) are associated with pedestrians in terms of their proximity. From previous analysis (table 47) we know that 90% of pedestrian accidents occur in an urban area. Variables indicating the rural accident are associated with accidents involving a driver: (TRG 3 rural region - secondary roads) VIT 3 and VIT 4 (speed above 45 m.p.h.).

Analysis of the proximities between variables

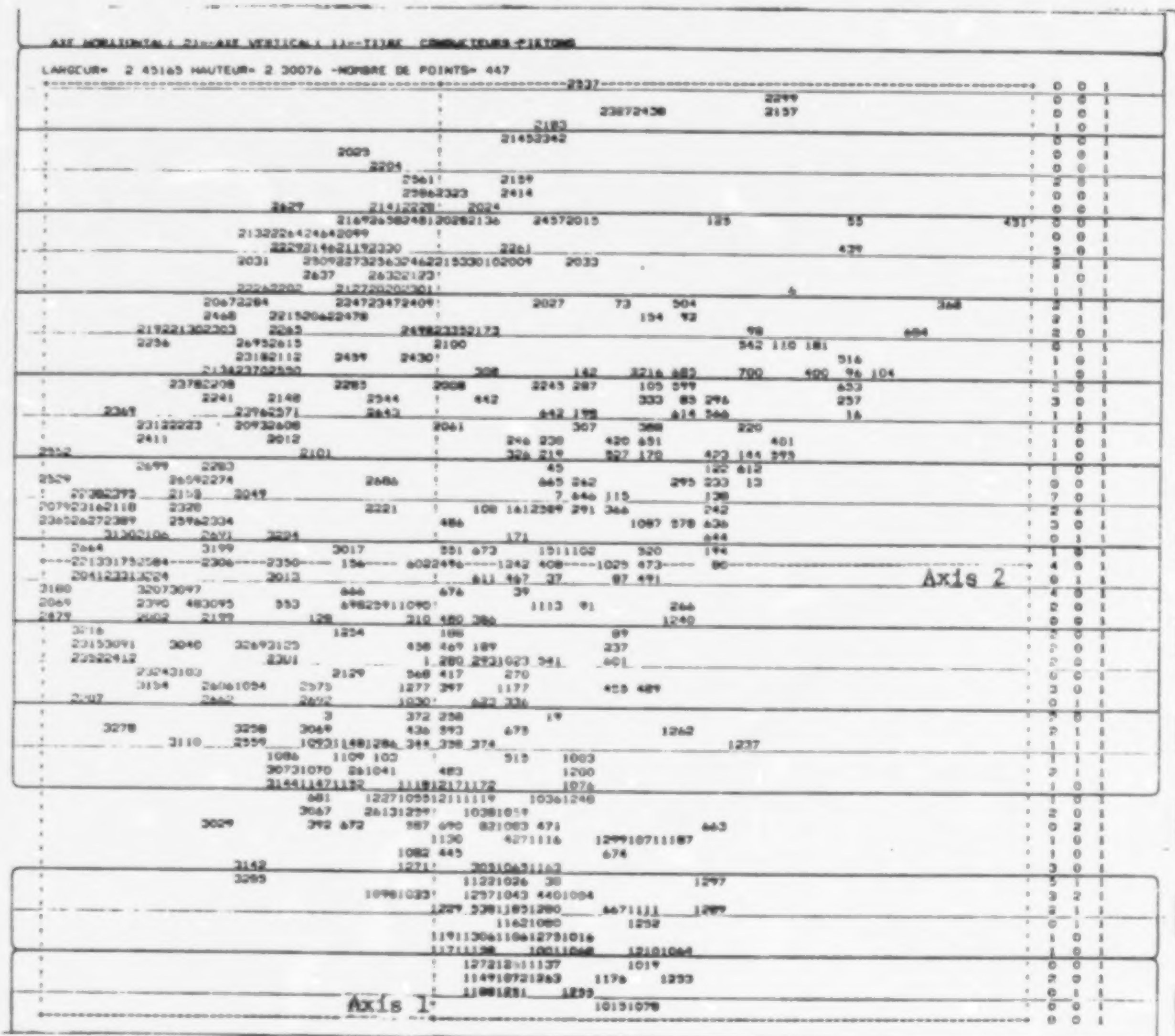
An examination of the most discriminant variables according to the first factor allows us to take our analysis a step further (Fig. 6 and 7). Pedestrians are associated with the following sub-variables: age group 0-14 years (AGE 1, 2, 3) and 65 years and more (AGE 10), female sex (SEX 2), injuries to the limb region (REG 6), simple fractures (TYP 2) and multiple fractures (TYP 3), trucks, buses and school buses (TYV 2) rather than automobiles (TYV 1). On the other hand, for drivers, we notice proximities between the 35-44 years (AGE 7), and 20-24 years (AGE 5) age groups.

For drivers, there are proximities between the following: 35-44 years (AGE 7), 20-24 years (AGE 5), 45-54 years (AGE 8), the male sex (SEX 1), facial injuries (REG 3), head-neck injuries (REG 2), chest (REG 4) and abdomen injuries (REG 5), lacerations (TYP 4), sprains (TYP 6) and internal injuries (TYP 7).

Some of these associations, such as the age groups, were already known, and have been confirmed by this analysis. Others are new, mainly those which relate to the types of injuries and parts of the body injured.

FIGURE 6

Drivers and pedestrians. Plan 1 X 2 issued from the correspondence analysis. Point-images of 447 victims.



Note: Codes 0 TO 999 : hospitalized drivers

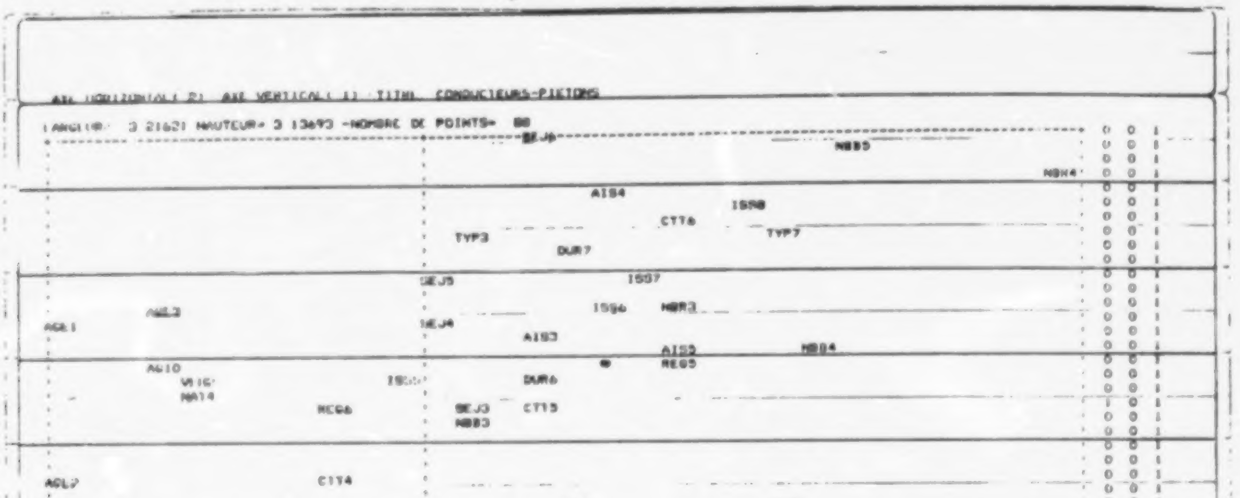
Codes 1000 TO 1999: non hospitalized drivers

Codes 2000 TO 2999: hospitalized pedestrians

Codes 3000 TO 3999: non hospitalized pedestrians

FIGURE 7

Drivers and pedestrians. Plan 1 X 2 issued from the analysis of correspondences. Point-images of 88 variables.



Note: See the following page for the key to the codes.

KEY TO THE CODE OF VARIABLES FOR DRIVERS (77) AND DRIVERS AND PEDESTRIANS (88) (Fig. 7)

Variables concerning the victim (67)

Demographic variables (12)

Victim's Age (AGE) (10)

* 1 0 - 4 YEARS
* 2 5 - 9 "
* 3 10 - 14 "
4 15 - 19 "
5 20 - 24 "
6 25 - 34 "
7 35 - 44 "
8 45 - 54 "
9 55 - 64 "
10 65 YEARS AND MORE

Victim's Sex (SEX) (2)

1: Male
2: Female

Variables Related to Care (20)

Length of Hospital Stay (SEJ) (7)

1: 0 - 4 DAYS
2: 5 - 9 "
3: 10 - 19 "
4: 20 - 29 "
5: 30 - 49 "
6: 50 DAYS AND MORE
7: OUT-PATIENT

Length of Treatment (DUR)(7)

1: 0 - 1 DAY
2: 2 - 7 DAYS
3: 8 - 14 "
4: 15 - 56 "
5: 57 - 182 "
6: 183 - 365 "
7: 365 DAYS AND MORE

Cost of Medical Services (CTT) (6)

1: 0 - 49 DOLLARS
2: 50 - 99 "
3: 100 - 149 "
4: 150 - 249 "
5: 250 - 499 "
6: 500 DOLLARS AND MORE

Injury Variables (28)

Number of Injuries (NBB) (5)

1: 1
2: 2
3: 3
4: 4
5: 5-6-7

Number of Body Regions Affected (NBR) (4)

1: 1
2: 2
3: 3
4: 4-5

Most Severely Affected Region (REG) (6)

1: General
2: Head-Neck
3: Face
4: Chest
5: Abdomen
6: Limbs

AIS Severity of the Most Severe Injury (AIS) (5)

1: 1 Scale AIS
2: 2 " "
3: 3 " "
4: 4 " "
5: 5 " "

Total Injury Severity (ISS) (8)

1: 1
2: 2 - 3
3: 4
4: 5 - 8
5: 9
6: 10 - 14
7: 15 - 19
8: 20 - 41

Type of Injuries (TYP) (7)

* 1: Cerebral Concussion
* 2: Simple Fracture
* 3: Multiple Fractures
* 4: Lacerations, Cuts
* 5: Contusions
* 6: Sprain, Wrench
* 7: Others

* Variable appearing only in the second analysis: drivers and pedestrians

Variables concerning the accident (21)

Accident Severity (GRV) (2)

1: Fatal
2: Non-Fatal

Type of Vehicle (VEH) (2)

1: Automobile (Sedan or Family)
2: Other Vehicle

Year of the Vehicle (Model) (ANV) (4)

1: Before 1969
2: 1969-70-71
3: 1972-73
4: 1974-75

Nature of the Collision (NAT) (4)

1: Frontal
2: Rear
3: Side
4: Skid, Overturn and others

Type of Region (TRG) (4)

1: Urban
2: Rural (Main Roads)
3: Rural (Secondary Roads)
4: Rural (Other Roads)

Speed Limit (VIT) (5)

1: 0 - 30 mph
2: 31 - 45 mph
3: 46 - 60 mph
4: 61 - 70 mph
5: UNDEFINED

iii) Conclusion to the second analysis: drivers and pedestrians

This application clearly indicates the relevance of the correspondence analysis method in working out the distinctive characteristics of drivers and pedestrians. As a result, the category of road user proves to be an extremely discriminant criterion for analysis of data on road accident victims. In the same way, in-patient victims have to be separated from out-patient victims since the criterion of hospitalization for severity seems to correspond to a clear reality. Moreover, it encourages us to treat deaths separately, and also perhaps certain very slightly injured victims who have been randomly situated in the group of injured victims. Finally, as with the first application to drivers who were alone, a clear distinction must be made between accidents occurring in an urban area and those occurring in a rural region.

d) Third analysis: pedestrians

The third analysis differs slightly from the first two, with respect to the choice of variables and the desired goal. In fact, the analysis has been oriented so as to obtain replies to more specific questions. We wanted to find out whether pedestrian accidents take place in well-defined circumstances, and whether the presence of certain characteristics influence the severity of injuries sustained by victims. Twenty-seven variables were used for each injured pedestrian, of which twenty-three are related to the accident circumstances. The emphasis is therefore placed on what happens at the time of the accident. On the other hand, we chose to study pedestrians for two reasons: 1) this is one of the categories of road users which sustains the most severe injuries; 2) the possibilities of prevention here are still very great compared to other categories of road users.

i) Data presentation

Our sample contains 189 cases of injured pedestrians; one of them has been excluded because of a lack of information on the injury severity. Twenty-seven variables were used for each of the victims; four of them concerning the injured victim i.e. age, sex, injury severity according to the police, and injury severity from the ISS index. The 23 other variables deal with the circumstances of the accident. These include time variables (month, day of the week, time of day), climatic variables (weather visibility, nature of the road surface), variables concerning the road network (region, locality, road category, nature of the surface, speed limit), variables concerning the vehicle involved (number, type of vehicle, condition, year, movement) and variables concerning the driver (age, sex, experience, driving limitations, sense of responsibility and sight). Finally, there is one variable summarizing the accident severity (fatal or not fatal).

After data transformation, 115 sub-variables were obtained (see pp. 153-154 for the description of the variables).

Our aim is to find similarities in the profiles of pedestrian accidents and to determine, for example, whether the most severe accidents present special characteristics.

ii) Results and interpretation

Significance of the first factors

For pedestrians, the first three axes of the analysis make up 14.2% of the total inertia. The first axis gives 6.4% of the inertia for 115 variables. This percentage is 7.4 times higher than for the independent variables: therefore there are certain links between the variables.

The first factor isolates the pedestrian accidents which present marginal characteristics. There are pedestrians not identified by the police, whose characteristics are less well known, and who differ from others by virtue of special accident circumstances: they are the marginals who do not present any precise profile (Fig. 8)

The second and third factors are on the contrary, more interesting from the view point of analysis (Fig. 9).

The second factor (horizontal axis) explaining 4.2% of the total inertia, separates the accident circumstances into two distinct categories: circumstances describing an environment that is generally safer and those characterizing a more or less unfavourable environment. The distribution is however strongly asymmetric: the point images of unfavourable circumstances are further from the center of distribution because these circumstances are more exceptional.

The third factor (vertical axis) explaining 3.7% of the total inertia, represents the level of severity of the accident: the point images of the injury severity according to the ISS index (ISS 1 to ISS 8) and according to the police (COD 1 to COD 4) are the ordinates increasing along the axis.

Analysis of the proximities between variables

The distribution of point variables in the four quadrants of the factorial diagram representing the second and third factors (Fig. 8) quite clearly define four sets of accident circumstances in which a pedestrian is injured.

I. Lower Right Section: The accident occurs between 10 and 18 h, during a week day (Monday, Wednesday, Thursday) between the months of April and November in a reduced-speed zone (0-20 m.p.h.). The accident is not fatal.

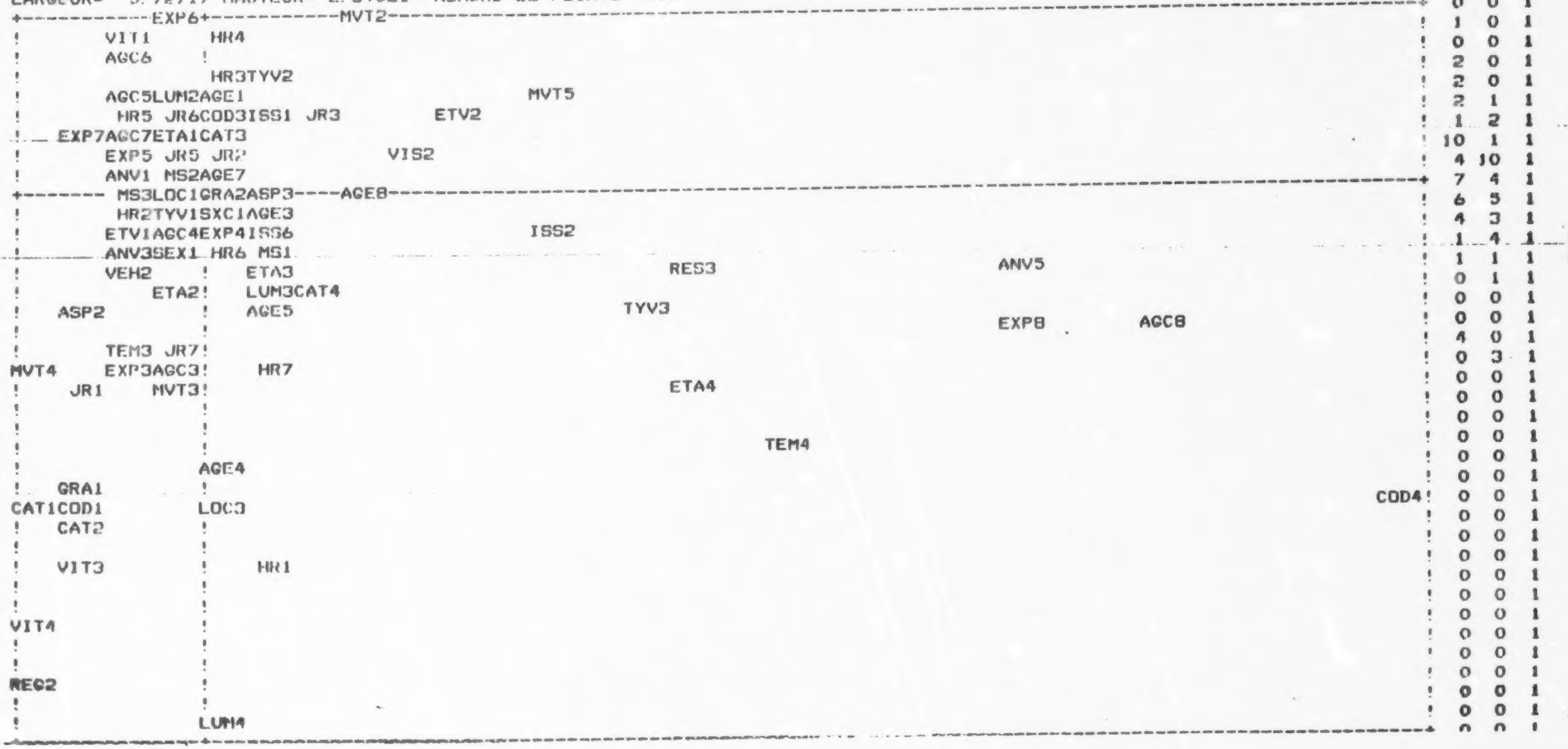
The driver, more often a female, is between 35 and 45 years old, has driving experience of 15-20 years, was turning (to the left or right) or was reversing at the time of the accident.

FIGURE 8

Pedestrians. Plan 1 X 2. Point-images of 115 sub-variables.

AXE HORIZONTAL(1)--AXE VERTICAL(2)--TITRE:PIETONS DE L'ECHANTILLON

LARGEUR= 5.72717 HAUTEUR= 2.89021 -NOMBRE DE POINTS= 115

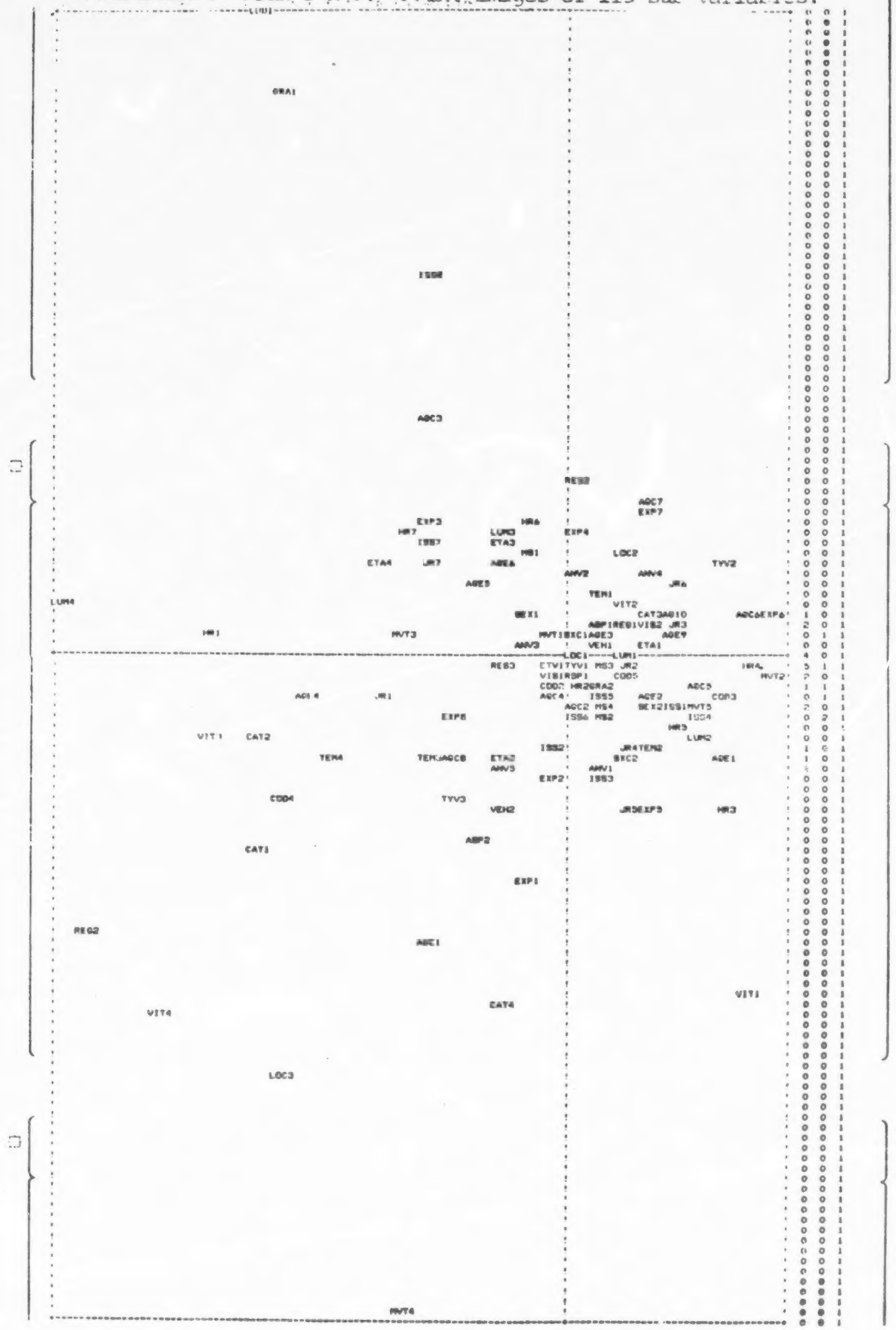


Axe 2

Note: See pages 146-147 for the key to the codes.

FIGURE 9

Pedestrians. Plan 2 X 3. Point-images of 115 sub-variables.



Note: See pages 153-154 for the key to the codes.

KEY TO THE CODE OF VARIABLES FOR PEDESTRIANS (115) (Fig. 8, 9)

Variables concerning the victim (25)

Victim's Age (AGE) (10)

1: 0 - 4 YEARS
2: 5 - 9 "
3: 10 - 14 "
4: 15 - 19 "
5: 20 - 24 "
6: 25 - 34 "
7: 35 - 44 "
8: 45 - 54 "
9: 55 - 64 "
10: 64 YEARS AND MORE

Victim's Sex (SEX) (2)

1: Male
2: Female

Injury Severity According to Police (COD) (5)

1: Death after Hospitalization
2: Hospitalization
3: Treatment at Outpatient Department
4: Injured Unidentified by Police
5: Undefined Severity

Injury Severity According to ISS (ISS) (8)

1: 1
2: 2 - 3
3: 4
4: 5 - 8
5: 9
6: 10 - 14
7: 15 - 19
8: 20 - 41

Variables concerning the accident (90)

Accident Severity (GRA) (2)

1: Fatal
2: Non-Fatal

Time Variables (18)

Month of the Accident(MS)(4)

1: Dec.-Jan.-Feb.-March
2: Apr.-May-June
3: July-August
4: Sept.-Oct.-Nov.

Day of the Accident (JR) (7)

1: Sunday
2: Monday
3: Tuesday
4: Wednesday
5: Thursday
6: Friday
7: Saturday

Time of Day (HR) (7)

1: Midnight to 6h
2: 6 to 10h
3: 10 to 13h
4: 13 to 15h
5: 15 to 18h
6: 18 to 21h
7: 21 to Midnight

Climatic Variables (12)

Weather (TEM) (4)

1: Clear
2: Cloudy
3: Rain
4: Snow - Sleet - Undefined

Visibility (LUM) (4)

1: Semi Obscure
2: Daylight
3: Night - Lighted road
4: Night - Non lighted road
Other - Undefined

Nature of the Road Surface (ETA) (4)

1: Dry
2: Wet
3: Snow - Ice
4: Other - Undefined

Variables concerning the Road (16)

Region (REG) (2)

1: Urban
2: Rural

Local (LOC) (3)

1: Between Intersection
2: Intersections
3: Other - Undefined

Variables concerning the Vehicle (17)

Number of Vehicles Involved (VEH) (2)

1: 1
2: More than one

Type of Vehicle (TYV) (3)

1: Automobile, coupé, sedan, Family, Taxi
2: Truck, Bus, Schoolbus
3: Motorcycle, Moped and others

Vehicle's Condition (ETV)(2)

1: No lack
2: Defective Tires
Undefined

Year of Vehicle (ANV)(5)

1: 1960-69
2: 1970-72
3: 1973
4: 1974-75
5: Undefined

Movement of Vehicle (MVT)(5)

1: Driving straight ahead
2: Turning or Reversing
3: Slowing Down, Starting or Stopped in Traffic
4: Overtaking
5: Other - Undefined

Road Category (CAT) (4)

1: Three-lane Road and more
2: Two-lane Roads
3: Public Road in Residential Area
4: Other

Nature of the Road Surface (ASP) (3)

1: Flat/Straight
2: Incline /Straight
3: Incline /Curve
Flat/Curve

Speed Limit (VIT) (4)

1: 0 - 20 mph
2: 21 - 30 mph
3: 31 - 50 mph
4: 60 - 70 mph

Variables concerning the Driver (25)

Age (AGC) (8)

1: 0 - 19 YEARS
2: 20 - 24 "
3: 25 - 29 "
4: 30 - 34 "
5: 35 - 44 "
6: 45 - 54 "
7: 55 YEARS AND MORE
8: Undefined

Sex (SXC) (2)

1: Male
2: Female

Driving Limitation (RES) (3)

1: None
2: Corrective Lenses
3: Other or Undefined

Driving Experience (EXP) (8)

1: 0 - 1 YEAR
2: 2 - 4 YEARS
3: 5 - 9 "
4: 10 - 14 "
5: 15 - 19 "
6: 20 - 29 "
7: 30 YEARS AND MORE
8: Undefined

Responsible (RSP) (2)

1: Yes
2: No

Visibility (VIS) (2)

1: Good
2: Reduced and undefined

The injured pedestrian is young (0-9 years) and a female, has injuries for which the ISS severity score can vary from 1 to 9, and requires medical care in an out-patient department.

This type of accident occurs in more or less favourable circumstances with respect to the environment and may be related to the density of pedestrian or vehicular traffic at these times of the day or to inexperienced pedestrians (young schoolchildren).

II. Upper Right Section: The accident takes place in an urban area, during a week day (Tuesday, Friday) on a dry road surface in clear weather, at an intersection. The driver, more often a man, (45 years and more) has more than 20 years of driving experience and wears corrective lenses for driving. He drives a new model truck or bus and his visibility is reduced at the time of the accident. The victim is an older person (55 years or more).

This second type of accident once again represents favourable environment factors: it is more closely related to characteristics of drivers whose vision and visibility are reduced or to pedestrians whose mobility is reduced because of age.

III. Upper Left Section: The accident occurs between 18 h and 6 h a.m. on an unlit road, on Saturday, during the winter months on a snowy or icy road. The accident is fatal.

The driver, aged between 25 and 30 years has 5 to 10 years driving experience, his vehicle was proceeding straight ahead or had slowed down at the time of the accident.

The victim is between 20 and 35 years, sustains very severe injuries (ISS of 15 and more) and dies after hospitalization.

This type of accident presents unfavourable environmental circumstances that play a very important role.

IV. Lower Left Section: The accident takes place in a rural area, in a high speed zone, mainly on a Sunday on a wet inclined road surface, when it is raining.

The driver is very young (less than 20 years old) and has little driving experience, he was overtaking at the time of the accident.

The victim is young (15-19 years) and sustains injuries requiring hospitalization.

This type of accident indicates both unfavourable environment conditions and special driver characteristics (youth, inexperience, overtaking movement) which are causation factors in the accident.

iii) Conclusion to the third analysis: pedestrians

The four types just examined can in fact be regrouped into 2 main ones: in the first group, the environmental conditions (in the general sense) are rather favourable and the accident seems linked to the density of the vehicle and pedestrian traffic as well as to special characteristics of injured pedestrians (inexperienced children, lack of mobility, or poor vision in old people) or of the drivers involved (lack of experience, females, and poor vision or visibility). We are dealing with the urban type of accident.

The second type usually results from unfavourable environmental conditions associated with certain driver characteristics (youth, inexperience and speed). This is more often a rural type of accident.

In this example, Benzecri's correspondence analysis suggests a clear distinction among pedestrian accidents according to the area where they occur, which confirms wha several other studies had shown (Berger, W.G. 4, Knoblauch, R.L. 10). Moreover, our analysis helped to clarify the important variables in each of the accident types, which should prove most useful for later studies.

The factorial analysis of correspondences as applied to road accident victims for 1974, has interrelated factors such as level of injury severity, the accident itself, and the region where the accident occurred.

Certain typologies resulting from this analysis suggest a simple classification as follows: 1) road users categories; 2) severity: hospitalized vs non hospitalized; 3) urban or rural setting.

The analysis also illustrated the importance of separating the urban accident from the rural accident by defining situations described by accident circumstances, drivers' characteristics, vehicles and victims as well as the relationships existing between these different characteristics.

This method allows for identifying factorial associations without weighing these factors in advance. The interesting results arrived at could be the subject of subsequent verifications that have not been carried out within the framework of this study.

IV CONCLUSION

CONCLUSION

This technical report, or working paper, offers detailed methodological results and discussion of a research project dealing with road crash injuries in Quebec. There were four main objectives:

1. To assess the quality of the data used and the quality of available published statistics on road accident victims. This was possible because the data base analysed permitted a comparison of police, hospital and medical records, namely the police report (Department of Transport), the hospital summary (Hospital Insurance Board), the medical care given by a physician whether the patient was hospitalized, treated in an OPD or a private office setting (Health Insurance Board).

It was found that the police report underestimated the number of casualties especially for minor injuries: 7 of 22 deaths were reported by the police as being deceased, the others were reported as being injured hospitalized victims; 72% of in-patient victims were correctly reported and 24% of out-patients were omitted. Therefore, working with two different hypotheses, the authors estimated that in 1974, there were possibly 70,000 casualties (or 79,600) a number which differs from the 55,961 officially reported victims.

Validity and accuracy tests were carried out to assess the value of the data base in the use of AIS and ISS classification. It was found in the inter-observer accuracy test that there were no great differences between the judgment of physicians and non-physicians in the application of the AIS and ISS classification on the data.

The validity test was carried out with a small number of cases (44) because confidentiality did not permit a larger sample. It compared two sources of data for AIS and ISS classification, the full hospital medical record and our data base, in order to check the value of the AIS and ISS classification on our data base.

As expected, the full hospital medical record identifies a greater number of injuries and AIS regions, thus influencing a higher ISS than our data base ISS. However, most often these greater numbers of injuries were for a minor degree of severity (AIS: 1). The full hospital medical record remains undoubtedly a more accurate source of data for crash injury assessment, but the data base used in this study allowed for a relatively reliable classification of injuries with practical advantages for different kinds of road safety analyses:
a) greater representativeness, i.e. less biased sampling of victims,
b) better use of secondary permanent data collected regularly by agencies means considerable cost savings.

2. The second and third objectives of this research focused on the description and analysis of the injuries of the victims and the measure of the consumption of medical and hospital services required by these persons, thus allowing for an analysis of direct costs of these services, and an indirect measure of the AIS and ISS classification

The frequency of certain types of injuries varies a great deal according to the category of road users, mainly between occupants of automobiles and non-occupants, the "unprotected road users": fractures predominate the picture for both categories if we discount lacerations and contusions, but in automobile occupants, simple fractures predominate and in unprotected road users, we find more multiple fractures. Motorcycle drivers are injured in fewer parts of the body (extremities mainly) than car occupants and cyclists.

Looking at severity of injury for different categories of road users with three indices, mean AIS of all injuries, mean AIS of the worst injury and mean ISS, a much greater severity is observed for in-patient compared to out-patient (ISS: 3x). This result is suggestive of the following rule of thumb for police reports: maintain this simple and precise classification of severity: killed, hospitalized, returned home with treatment, no treatment. In fact in a previous study the authors examined police report categories in the Canadian provinces and other states and countries and found that this simple categorization was missing in some of them.

It is also worth mentioning that although police reports categorize road users, neither the provinces nor statistics Canada compute these categories, which limits many useful comparative longitudinal studies.

The measure of the consumption of medical and hospital services related to road crash injuries has led us to evaluate the direct costs of these services and the validity of the different severity indices used.

Pedestrians' length of stay in hospital is almost double that of drivers. Motorcyclists are most often hospitalized. In addition, they return most often to seek OPD or private physician's office consultation, thus entailing a length of treatment longer than other road users. Hospitalized pedestrians generate the highest costs followed closely by motorcyclists.

It is interesting to note that when the victims are characterized by the most severe injury, pedestrians and motorcyclists are in greater evidence than automobile drivers and passengers but the comparison between ISS and AIS did not allow us to elucidate a statistically significant difference.

However, it must be emphasized that we are confident in the ISS index as a valid indicator of severity because of the relationship we observed between ISS and the length of stay in hospital (X^2 was significant at 1% level) (see Appendix IV p. 187).

Pedestrians are subject to particularly severe injury risks and generate high direct costs in terms of medical and hospital services. Moreover, possibilities of intervention at the level of preventing pedestrian accidents still seem to be very great.

3. After having studied morbidity and its effects on medical care, the fourth objective focused on a few characteristics pertaining to the victim, the motor vehicle and the environment.

Two types of analyses were done: 1) examination of crossed tables and 2) multidimensional analysis: the factorial analysis of correspondence (Benzecri's method) that uses contingency tables. Profiles of accidents have been described from the first analysis. For example, in our sample, 90% of pedestrian accidents occur in an urban area, 51% of them in the day time, and 56% of the victims are men.

The second method was used for three analyses of different samples of victims: 258 drivers, 258 drivers and 189 pedestrians and 189 pedestrian victims alone.

Certain typologies resulting from these analyses clearly suggest classifying victims according to the category of road users, classifying severity according to in-patient victims or out-patients, and classifying accidents in an urban or a rural setting.

The drivers' analysis showed two-dimensional accident profiles: a) an urban type of crash, a rear collision occuring in a 30 m.p.h. zone with a recent model vehicle; the victim, a woman aged 35-44 years sustaining minor injuries and being treated as an out-patient victim; b) a rural frontal collision occurring in a secondary road, skidding or overturning, in a 50-60 m.p.h. zone, the victim, a male aged 55 years and over sustaining severe injuries to limb, abdomen or chest and being hospitalized.

These last two interesting results would need to be subjected to additional verification, which has not been done in this study. The multifactorial analysis of correspondence identifies factorial associations without weighing these factors in advance.

Several practical conclusions arise from this pilot study, in addition to new results shown in this report.

1. The record linkage of secondary information from several departments offers the advantage of greater reliability as well as the possibility of pin pointing the complex problems involved in analyzing the evolution of the phenomenon, the effects of legislative measures and clues to causation, this in certain feasible conditions. The accidents are proof of the importance of road safety whence the importance of their analysis for public health, health care costs and compensation costs to victims.

2. Hospital Insurance Report 101, in conjunction with data from Health Insurance gives sufficiently reliable information, compared to the medical record, for an adequate classification of road accident injuries and victims.

3. Our study shows that in making up their reports, police officers must place basic information into categories corresponding to different severities. This could be useful to research workers who lack the required data for severity but do not necessarily require the precision of AIS to carry out their work. While there is a tendancy, at the present time, to eliminate certain categories on police reports, these categories should be maintained.

4. The cost of acquiring such a file is modest compared to other types of data acquisition and gives more information and accuracy than the analysis of individual reports without record linkage.

5. A simple breakdown of official statistics published by Statistics Canada per category of road users, would provide interesting analytic studies for researchers.

6. A systematic study should be undertaken of how definitions of road accident deaths are applied, both in provincial police reports and in vital statistics.

7. It might be worth improving the ISS classification with a factor accounting for the victims' age: age adds a factor to the risk of death.

8. A systematic procedure must be developed to find out road usage. Without this variable, it is often difficult to measure behavioral differences and identify risk factors.

9. The problem of the study of road accidents is extremely complex, and this complexity is increased by the fact that people know or think they know everything about accidents. Each profession develops its own theory: jurists look for the people responsible for accidents, the news media look for the cause of the accident, the police write a report, engineers study the action of causal factors, actuaries want to predict the number of accidents. As a final suggestion, I would like to quote Ludwig Benner: "The accident research community and the accident investigator community must increase their contacts, and begin to exchange understandings of accident theories, methodologies, and criteria for each others' deliverables. Until this happens, I do not foresee significant accident research breakthroughs in the transportation safety field!"

V APPENDICES

APPENDIX I

INFORMATION SHEET

INFORMATION SHEET *

1. Case number ____________________
2. Type of file ____________________
3. Row or box ____________________
4. Date of use and agent ____________________
5. COMPOS ____________________
6. NAM ____________________ (Name) ____________________
7. Date of the accident ____________________
8. Type of accident ____________________
9. Category of road user ____________________
10. Area of accident ____________________
11. Accident report ____________________
12. Medical expense sheet ____________________
13. Hospitalization report ____________________
14. Out-patient department ____________________
15. Drivers (names) ____________________

____

____

16. Other victims (names, date of birth) __________ __________

____

____

17. Hospitalization: Institution's code ____________________

Admission number ____________________

Medical record number ____________________

18. Requests ____________________

____

____

____

19. Other ____________________

____

____

* English translation of "Feuille de renseignements", the instrument used.

APPENDIX II

INITIAL SAMPLE, REJECTED AND EFFECTIVE FILES (FINAL SAMPLE) FOR EACH CATEGORY OF FILES

Table A-I

Initial sample, rejected and effective files (final sample) for the active files category (1st type)

Row (number)	Total files	Initial sample			Rejected files			Final sample		
		H	NH	Total	H	NH	Total	H	NH	Total
4	286	I4	7	2I	I	I	2	I3	6	I9
7	26I	I9	I0	I9	2	I	3	I7	9	26
I4	304	29	5	34	6	3	9	23	2	25
25	253	22	5	27	3	0	3	I9	5	24
44	30I	27	7	34	I	I	2	26	6	32
45	339	25	II	36	8	I	9	I7	I0	27
47	287	24	I4	38	3	3	6	2I	II	32
49	299	I9	3	22	I	0	I	I8	3	2I
54	277	23	9	32	2	2	4	2I	7	28
56	323	35	9	44	4	I	5	3I	8	39
59	3I5	3I	II	42	2	2	4	29	9	38
Total	3245	268	9I	359	33	I5	48	235	76	3II

H = hospitalized

NH = non-hospitalized

Table A-II

Initial sample, rejected files and final sample for the active files category (2nd type)

Box number	Total files	Initial sample						Rejected files			Final sample		
		Acc. Road 1974			-Acc. Road 1974								
		H	NH	Tot.	H	NH	Tot.	H	NH	Tot.	H	NH	Tot.
3	I6			I									
6	23			2				I	0	I			
I3	24			I									
I4	I2			3									
2I	2I			2									
22	I7			2				I	0	I			
24	23			4				I	0	I			
27	II			4									
34	II			2									
38	20			2									
39	26			3				I	0	I			
	204	I9	7	26			I	4	0	4	I4	7	2I
43	I3			3									
47	I4			2									
53	25			I									
58	26			6				2	0	2			
6I	2I			3				I	0	I			
62	38			4									
63	29			2				I	0	I			
69	26			7				I	0	I			
	I92	25	3	28			3	5	0	5	I7	3	20
7I	25			5				I	0	I			
73	20			4				I	0	I			
74	25			4				2	0	2			
75	26			7				I	0	I			
8I	3I			5				I	0	I			
82	30			2									
98	I2			2									
I00	I9			2				I	0	I			
I02	25			4									
I04	20			I									
	283	32	4	36			5	7	0	7	20	4	24
III	I6			I									
I28	26			0									
I3I	29			3									
I36	27			4				I	0	I			
I39	23			5				I	0	I			

Table A-II (cont'd)

Box Number	Total Files	Initial sample						Rejected files			Final sample		
		Acc.	Road	1974	Acc.	Road	1974						
		H	NH	Tot.	H	NH	Tot.	H	NH	Tot.	H	NH	Tot.
I46	34			4				2	0	2			
I5I	I3			I									
I57	20			0									
I63	40			7				2	0	2			
I73	30			3									
	258	22	6	28			2	6	0	6	I4	6	20
I80	25			4				I	0	I			
I86	26			2									
I94	I4			I				I	0	I			
203	32			2									
206	I8			I									
209	I5			4									
2I8	22			I									
232	I6			I									
245	24			I									
25I	24			3									
255	30			I									
265	24			4				2	0	2			
	270	I8	7	25			4	4	0	4	I0	7	I7
269	3I			3									
276	I9			2				I	0	I			
282	7			0									
290	I8			2									
299	I6			I				I	0	I			
30I	I7			2				I	0	I			
3I4	22			5				I	0	I			
3I9	I3			6				I	0	I			
333	20			5				I	0	I			
342	2I			5				I	0	I			
35I	37			3				I	0	I			
	22I	29	5	34			5	8	0	8	I6	5	2I
355	22			2				I	0	I			
358	24			4				I	0	I			
363	33			5									
	79	7	4	II			0	2	0	2	5	4	9
372	28			3									
373	27			2									
384	22			2				I	0	I			
387	I4			3				I	0	I			
39I	35			I									
40I	23			3									
408	22			2				I	0	I			
4I8	2I			I									
424	I8			I				I	0	I			
428	I6			3									

Table A-II (cont'd)

Box Number	Total Files	Initial sample						Rejected files			Final sample		
		Acc. Road 1974			Acc. Road 1974								
		H	NH	Tot.	H	NH	Tot.	H	NH	Tot.	H	NH	Tot.
429	I7			I				I	0	I			
432	9			2									
435	I9			2									
438	22			3									
44I	24			4									
448	26			I									
	343	22	I2	34			2	6	0	6	I4	I2	26
465	22			I				I	0	I			
48I	26			I									
484	30			I									
495	25			2									
50I	24			3				I	0	I			
5I0	33			3									
5I8	3I			5				I	0	I			
523	I4			2									
539	3I			3									
547	39			3									
55I	26			I									
560	35			4				I	0	I			
564	23			4				I	0	I			
579	40			3									
	399	30	6	36			9	5	0	5	I6	6	22
584	2I			2									
587	33			7				2	0	2			
594	I7			5				2	0	2			
595	I8			2									
597	38			5									
	I27	I7	4	2I			5	4	0	4	8	4	I2
Total	2326	221	58	279	36	0	36	5I	0	5I	I34	58	I92

Table A-III

Final sample, rejected files and final sample for the closed files category

Box Number	Total Files	Initial sample			Rejected files			Final sample		
		H	NH	Tot.	H	NH	Tot.	H	NH	Tot.
2	54	I	2	3	I	0	I	0	2	2
II	46	4	4	8				4	4	8
20	50	II	4	I5	0	I	I	II	3	I4
26	34	7	3	I0				7	3	I0
30	46	2	4	6				2	4	6
35	40	2	8	I0	I	0	I	I	8	9
50	4I	4	2	6	0	I	I	4	I	5
58	43	6	2	8	0	2	2	6	0	6
59	38	I	3	4				I	3	4
65	38	3	4	7	0	I	I	3	3	6
70	40	4	4	8				4	4	8
84	43	I	0	I				I	0	I
85	37	3	6	9	I	0	I	2	6	8
96	45	2	2	4	0	I	I	2	I	3
I0I	45	3	0	3				3	0	3
I03	49	6	4	I0	0	I	I	6	3	9
III	39	3	5	8	2	2	4	I	3	4
II6	48	7	4	II	2	I	3	5	3	8
I23	3I	6	2	8	2	I	3	4	I	5
I28	34	8	2	I0	2	I	3	6	I	7
I33	23	3	I	4				3	I	4
I40	38	II	3	I4	2	0	2	9	3	I2
I43	37	5	2	7				5	2	7
I44	45	I0	4	I4	I	I	2	9	3	I2
I46	42	II	2	I3	4	0	4	7	2	9
I54	34	7	4	II	2	I	3	5	3	8
I6I	37	9	3	I2	2	0	2	7	3	I0
I66	33	I0	0	I0	2	0	2	8	0	8
I68	42	I2	4	I6	2	I	3	I0	3	I3
I72	34	6	3	9	2	I	3	4	2	6
I75	3I	8	3	II	2	I	3	6	2	8
I8I	28	7	I	5	I	0	I	6	I	7
I83	35	8	4	I2				8	4	I2
I89	25	5	3	8				5	3	8
I94	4I	II	4	I5	I	0	I	I0	4	I4
I97	36	7	4	II				7	4	II
202	4I	I5	4	I9	3	3	6	I2	I	I3
207	37	I0	3	I3	I	I	2	9	2	II

TABLE A-III (cont'd)

Box Number	Total Files	Initial sample			Rejected files			Final sample		
		H	NH	Tot.	H	NH	Tot.	H	NH	Tot.
2II	37	I3	I	I4	I	0	I	I2	I	I3
2I6	40	6	6	I2	2	0	2	4	6	I0
2I8	48	6	6	I2	2	0	2	4	6	I0
2I9	43	I2	7	I9	0	I	I	I2	6	I8
220	43	8	5	I3	I	0	I	7	5	I2
22I	36	9	I	I0				9	I	I0
223	36	I2	5	I7	I	I	2	II	4	I5
230	37	I0	4	I4	I	2	3	9	I2	II
238	53	2	I	3	0	I	I	2	0	2
245	38	2	5	7	I	I	2	I	4	5
246	34	I	6	7				I	6	7
253	44	9	I	I0	2	0	2	7	I	8
255	48	3	4	7	0	I	I	3	3	6
263	38	5	I	6	0	I	I	5	0	5
270	37	4	4	8	2	4	6	2	0	2
275	53	5	3	8				5	3	8
276	43	I	2	3				I	2	3
287	42	5	5	I0	0	I	I	5	4	9
293	4I	7	I	8				7	I	8
308	46	2	2	4	I	I	2	I	I	2
3I5	42	4	6	I0	0	2	2	4	4	8
322	48	0	8	8	0	I	I	0	7	7
330	58	4	I	5				4	I	5
337	52	7	2	9	2	0	2	5	2	7
339	46	4	4	8				4	4	8
347	4I	5	5	I0	2	I	3	3	4	7
Total	2604	385	2I3	598	54	39	93	33I	I74	505
%		(64.4)	(35.6)	(I00.0)	(58.I)	(4I.9)	(I00,0)	(65.5)	(34.5)	(I00)

APPENDIX III

Elements of the TPLS File

1. Accident report (PQ-1)
2. Hospital Insurance Form (AH-101 and AH-85)
3. Questionnaire from the TPS
4. Case History of Medical Services

RAPPORT D'ACCIDENT AUTOMOBILE
MINISTÈRE DES TRANSPORTS
BUREAU DES VÉHICULES AUTOMOBILES

INFORMATIQUE
DÉLIT DE FUITE
N° FEUILLE

LIEU DE L'ACCIDENT MUNICIPALITÉ COMTÉ
N° DOSSIER OU PLAINTE POSTE
N° ROUTE N° CIVIQUE RUE/RANG/CHEMIN INTERSECTION/PRÈS DE CODE GÉOGRAPHIQUE
DISTANCE DE L'INTERSECTION
ENTRE INTERSECTIONS 11– AU BORD ... 45– INTERSECTION 46– RUELLE ... 20– VIADUC 21– PASSAGE À NIVEAU ... 25– TERRAIN OU CHEMIN PRIVÉ 99– AUTRE
JOUR
DATE JR MS AN.
HEURE HRES MIN

GRAVITÉ 1– MORTEL 2– BLESSÉS 3– DOMMAGES MATÉRIELS SEUL.
NOMBRE DE PERSONNES TUÉES ... BLESSÉES
NOMBRE DE VÉHICULES IMPLIQUÉS

GENRE: VÉH. AUTO ET ... 11– PIÉTON 12– VÉH. AUTO 13– TRAIN 14– ANIMAL 15– CYCLISTE 17– EXCAVATION 18– OBJET FIXE 19– BORNE MOBILE 20– SANS COLLISION 21– CORPS ÉTRANGER 99– AUTRE
TEMPS: 1– CLAIR 2– NUAGEUX 3– BROUILLARD 4– PLUIE ... NEIGE ... BRUINE ... AUTRE
SURFACE: SÈCHE ... MOUILLÉE ... GLACÉE ... BOUEUSE ... ENNEIGÉE ... AUTRE
CIRCULATION: CONTRÔLÉE PAR 11– FEUX DE CIRCULATION ... AGENT DE POLICE 12– FEUX D'ÉCOLIERS ... SIGNAL AUTOMATIQUE 13– FEUX DE PIÉTONS ... 14– SIGNAL « ARRÊT » ... AUCUN CONTRÔLE 15– FEU ROUGE CLIGNOTANT

VÉHICULE

CONDUCTEUR: NOM, PRÉNOM
PERMIS DE CONDUIRE DATE DE NAISSANCE S CAT CL RESTRICTION PROV.-ÉTAT
ADRESSE N°. RUE APT MUNICIPALITÉ DATE D'EXPIRATION ANNÉES
N° TÉL. DOMICILE N° TÉL. AFFAIRES MARQUE ANNÉE COULEUR N° IMMATRICULATION ANNÉE PROV.-ÉTAT
TYPE DE VÉHICULE 11– 4 PORTES 12– 2 PORTES 13– STATION WAGON 14– CAMION 15– CAMION-REMORQUE 16– BICYCLETTE 17– TAXI 18– AUTOBUS 19– MOTOCYCLETTE 20– SCOOTER 21– TRACTEUR 22– AMBULANCE 23– AUTOBUS SCOLAIRE 24– MOTO-NEIGE 99– AUTRE
DOMMAGES AU VÉHICULE
PROPRIÉTAIRE: NOM, PRÉNOM ADRESSE: N°. RUE MUNICIPALITÉ N° TÉLÉPHONE
ASSURANCE: NOM DE LA CIE N° DE POLICE DATE D'EXPIRATION
REMORQUAGE GARAGE ☐ FOURRIÈRE ☐ MUNICIPALE ☐ NOM DU GARAGE ADRESSE
DE À
ENCERCLEZ LES DOMMAGES

VÉHICULE

CONDUCTEUR: NOM, PRÉNOM
PERMIS DE CONDUIRE DATE DE NAISSANCE S CAT CL RESTRICTION PROV.-ÉTAT
ADRESSE N°. RUE APT MUNICIPALITÉ DATE D'EXPIRATION ANNÉES
N° TÉL. DOMICILE N° TÉL. AFFAIRES MARQUE ANNÉE COULEUR N° IMMATRICULATION ANNÉE PROV.-ÉTAT
TYPE DE VÉHICULE 11– 4 PORTES 12– 2 PORTES 13– STATION WAGON 14– CAMION ... CAMION-REMORQUE ... BICYCLETTE ... TAXI ... AUTOBUS ... MOTOCYCLETTE ... SCOOTER ... TRACTEUR ... AMBULANCE ... AUTOBUS SCOLAIRE ... MOTO-NEIGE ... AUTRE
DOMMAGES AU VÉHICULE
PROPRIÉTAIRE: NOM, PRÉNOM ADRESSE: N°. RUE MUNICIPALITÉ N° TÉLÉPHONE
ASSURANCE: NOM DE LA CIE N° DE POLICE DATE D'EXPIRATION
REMORQUAGE GARAGE ☐ FOURRIÈRE ☐ MUNICIPALE ☐ NOM DU GARAGE ADRESSE
DE À

DOMMAGES À LA PROPRIÉTÉ AUTRE QU'UN VÉHICULE(S) DESCRIPTION MONTANT APPROXIMATIF $
PROPRIÉTAIRE NOM, PRÉNOM ADRESSE N° TÉLÉPHONE

TUÉS OU BLESSÉS

INSCRIRE LES NOMS, PRÉNOMS ADRESSES ET N°s DE TÉLÉPHONE	CODE T — TUÉ H — HOSPITALISÉ R — RETOURNÉ AU FOYER APRÈS TRAITEMENT N — NUL TRAITEMENT REQUIS	N° VÉHICULE	SEXE	ÂGE	CEINTURES				
1									
2									
3									
4									
5									

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ TRANSPORTÉ PAR MÉDECIN/HÔPITAL
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ TRANSPORTÉ PAR MÉDECIN/HÔPITAL

CORPS DE POLICE UNITÉ/AUTO-RADIO SIGNATURE DU POLICIER MATRICULE

CONDITIONS DE ROUTE

LUMIÈRE
1– AUBE
2– JOUR
3– CRÉPUSCULE
4– NUIT, CHEMIN ÉCLAIRÉ
5– NUIT, CHEMIN NON ÉCLAIRÉ
9– AUTRE ...

NATURE DE LA CHAUSSÉE
1– ASPHALTE
2– BÉTON
3– GRAVIER
4– TERRE
9– AUTRE

CATÉGORIE DE VOIE
11– AUTOROUTE
12– VOIE ÉLEVÉE
13– ROUTE À CHAUSSÉE DIVISÉE
14– ROUTE À TROIS VOIES
15– ROUTE À DEUX VOIES
16– VOIE D'ACCÈS
17– VOIE DE SORTIE
18– VOIE PUBLIQUE EN ZONE HABITÉE
19– RANG
20– TERRAIN OU CHEMIN PRIVÉ
99– AUTRE ...

ASPECT DE LA CHAUSSÉE
1– SURFACE PLANE, EN LIGNE DROITE
2– SURFACE PLANE, EN COURBE
3– PENTE EN LIGNE DROITE
4– PENTE EN COURBE
9– AUTRE ...

ÉTAT DE LA CHAUSSÉE
1– EN BON ÉTAT
2– TROU, ORNIÈRE, CAHOT
3– OBSTACLE SIGNALÉ
4– OBSTACLE NON SIGNALÉ
5– EN RÉPARATION
6– EN CONSTRUCTION
9– AUTRE

R1

COPIE POUR LE BUREAU DES VÉHICULES AUTOMOBILES

CPO 1

INFORMATIQUE ➡ [illegible] RUE [illegible] VÉHICULE 1 VÉHICULE 2 [illegible]

NOM, PRÉNOM ADRESSE N° TÉLÉPHONE

NOM, PRÉNOM ADRESSE N° TÉLÉPHONE

NOM, PRÉNOM ADRESSE N° TÉLÉPHONE

MOUVEMENT DES VÉHICULES

12– [illegible]
13– TOURNANT À GAUCHE
14– TOURNANT À DROITE
15– [illegible] CIRCULATION

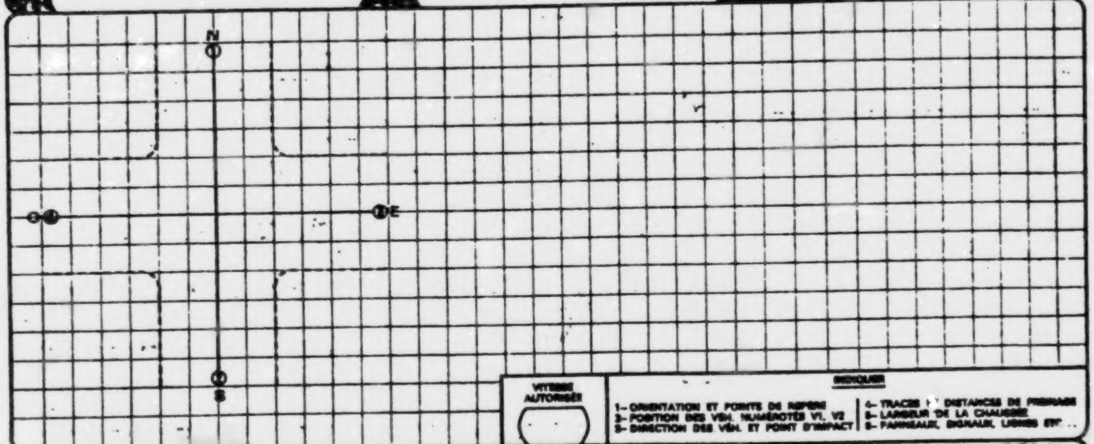
V-1 V-2

1– AUCUN DÉFAUT APPARENT
2– FREINS DÉFECTUEUX
3– PNEUS DÉFECTUEUX
4– DIRECTION DÉFECTUEUSE
5– PHARES DÉFECTUEUX
6– PARE-BRISE DÉFECTUEUX

V-1 V-2

V-1 V-2

V-1 V-2



VITESSE AUTORISÉE

INDIQUER

1– ORIENTATION ET POINTS DE REPÈRE
2– POSITION DES VÉH. NUMÉROTÉS V1, V2
3– DIRECTION DES VÉH. ET POINT D'IMPACT
4– TRACES ET DISTANCES DE FREINAGE
5– LARGEUR DE LA CHAUSSÉE
6– PANNEAUX, SIGNAUX, LIGNES ETC...

CONDUCTEURS

ACTION

OPINION DU POLICIER

11– EXCÉDANT LA VITESSE PERMISE
12– EXCÉDANT LA VITESSE PRUDENTE
13– DÉRAPAGE
14– PERTE DE CONTRÔLE
15– N'A PAS CÉDÉ LE DROIT DE PASSAGE AU VÉHICULE
16– CONDUISANT DU MAUVAIS CÔTÉ DE LA VOIE
17– CONDUISANT CONTRAIREMENT AU SENS UNIQUE
18– COUPAIT EN DÉPASSANT
19– DÉPASSANT À DROITE
20– DÉPASSANT SANS SIGNALER
21– A IGNORÉ LE SIGNAL « ARRÊT »
22– A IGNORÉ LE SIGNAL D'UN POLICIER
23– PASSANT AU FEU JAUNE
24– A IGNORÉ LE FEU DE CIRCULATION
25– A IGNORÉ LE FEU CLIGNOTANT
26– SUIVAIT DE TROP PRÈS
27– A TOURNÉ TROP LARGE À DROITE
28– A TOURNÉ TROP COURT À GAUCHE
29– A TOURNÉ DEPUIS LA MAUVAISE ALLÉE
30– A TOURNÉ SANS SIGNALER
31– EFFECTUANT UN DEMI-TOUR
32– STATIONNÉ DANS UN ENDROIT DANGEREUX
33– MAUVAIS DÉPART D'UN ENDROIT DE STATIONNEMENT
34– STATIONNÉ DANS UN ENDROIT [illegible]
[illegible] RECULANT ILLÉGALEMENT DANS ARRÊT
[illegible] A NÉGLIGÉ D'ALLUMER LES PHARES
[illegible] EST PARTI AVANT L'APPARITION DU FEU VERT
[illegible] VISIBILITÉ OBSTRUÉE
40– N'A PAS CÉDÉ LE PASSAGE AU PIÉTON
41– A DÉPASSÉ OU CROISÉ AUTOBUS SCOLAIRE À L'ARRÊT
42– CONDUISANT NÉGLIGEMMENT
[illegible] AUTRE

C-1 C-2

ÉTAT DES CONDUCTEURS ET PIÉTONS

1– APPAREMMENT NORMAL
2– FACULTÉS AFFAIBLIES
3– APPAREMMENT ENDORMI
4– DÉFAUT PHYSIQUE
5– MALADE
[illegible] AUTRE

C-1 C-2 P-1 P-2 P-3 P-4 P-5

MOUVEMENT DES PIÉTONS

1– TRAVERSAIT À L'INTERSECTION ILLÉGALEMENT
2– TRAVERSAIT À L'INTERSECTION LÉGALEMENT
3– TRAVERSAIT ENTRE DEUX INTERSECTIONS
4– TRAVERSAIT DIAGONALEMENT
5– TRAVERSAIT DERRIÈRE OU DEVANT UN VÉH. STATIONNÉ
6– MONTAIT OU DESCENDAIT D'UN VÉHICULE
7– TRAVAILLAIT OU JOUAIT SUR LA VOIE
8– FAISAIT DE L'AUTO-STOP
9– SE TROUVAIT HORS DE LA VOIE
[illegible] AUTRE

P-1 P-2 P-3 P-4 P-5

POURSUITES RECOMMANDÉES

	CODE DE LA ROUTE	CODE CRIMINEL	RÈGLEMENT MUNICIPAL	CONTRAVENTION
V-1	ART.	ART.	ART.	N°
V-2	ART.	ART.	ART.	N°

REMARQUES: VISIBILITÉ, DÉFECTUOSITÉ DES SIGNAUX DE CIRCULATION ETC...

PERSONNES OU SERVICES AVERTIS

DISTRIBUTION

UNITÉ

SIGNATURE DU POLICIER MATRICULE AUTO-RADIO

VÉRIFIÉ PAR RAPPORT REÇU LE

COMMENTAIRES ADDITIONNELS:

AH-101
Rev. 75

182

Gouvernement du Québec
Ministère des Affaires Sociales
(Assurance-Hospitalisation)

1 Préfixe/*Prefix* | Code établissement | Année *Year* | N° d'admission/*Admission Number*

2 Établissement | N° dossier médical/*Medical Record*

3 Admission antérieure *Previous Admission* | Oui/*Yes* ☐ Non/*No* ☐ | Date de pré-admission *Pre Admission Date* | N° chambre *Room No.*

4 [illegible] *Patient's Condition on Arrival* | Urgence 1. *Emergen.* | Semi-urg. 2. *Urgent* | Électif 3. *Elective*

5 Nom du malade/*Patient's Name* | Prénoms/*Given Names* | Nom de fille de l'épouse/*Spouse's Maiden Name* | Nom de fille de la mère/*Mother's Maiden Name*

6 Adresse du malade *Patient's Address* | Numéro/*Number* | Rue/*Street* | Municipalité/*Municipality* | Comté/*County* | Code postal | Code municipal

7 Adresse antérieure (en cas de changement d'adresse dans les trois derniers mois)/*Previous Address (in case of a change in the last three months)* | Date du changement *Date of Change*

8 Téléphone | Nationalité *Nationality* | Statut *Status* | Depuis quand? *Since when?* | Religion | Baptisé *Baptized* | Lieu de naissance/*Birth Place* | Date de naissance *Birth Date* | Âge | Sexe et état civil *Sex and Status*

9 En cas d'urgence, avertir *In emergency, Notify at Home* | Oui/*Yes* ☐ Non/*No* ☐ | Nom/*Name* | Adresse/*Address* | Téléphone | Lien de parenté/*Relationship*

10 Employeur/*Employer* | Adresse/*Address* | Téléphone | Profession du malade *Patient's Occupation*

11 Père: nom et prénoms/*Father: Name and Given Names* | Mari: nom et prénoms/*Husband: Name and Given Names* | Employeur: Père ou mari *Employer: Father or Husband*

12 Assurance/*Insurance* Oui/*Yes* Non/*No* | Si oui: nom de la compagnie/*If Yes: Name of Company* | Arrivé par/*Arrived by* Ambulance | Voiture patrouille N° et matricule *Police Car No. and Badge*

13 N° de certificat/*Certificate No.* | N° de contrat/*Contract No.* | N° de groupe/*Group No.* | Numéro ass.-maladie/*Health Insurance Number*

14 Médecin recommandant/*Referring Physician* | Adresse/*Address*

15 Diagnostic provisoire/*Provisional Diagnosis* | Médecin traitant/*Attending Physician*

	Jours gratuits *Number of Days without Charge*	Salle *Ward*	Semi-privé *Semi-Private*	Salle ordinaire *Standard Room*	Privé *Private*
Logement *Accommodation*					
Requis *Requested*					
Fourni *Supplied*					

16 Responsabilité du paiement *Responsibility for payment*

M.A.S. D.S.A.	[illegible]	C.A.T. W.C.C.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	2	3	4	5	6	7	8

17 Transféré de/*Transferred from* | Date d'accident | Code Accident Code | Date d'admission | Heure/*Time* | Autorisation du congé *Authorization for discharge* | Date

Sortie/*Discharge* | Date | Heure/*Time*

18 Je demande pour moi-même, ou le malade ci-haut nommé, les avantages de la loi de l'Assurance-hospitalisation du Québec. J'accepte de payer le supplément journalier de ☐ pour une chambre privée, semi-privée ou salle ordinaire. J'autorise l'établissement ainsi que le ou les médecins traitants ou consultants à fournir au ministère des Affaires Sociales les renseignements nécessaires sur la présente hospitalisation. J'assume l'entière responsabilité financière de l'hospitalisation à compter de la date du congé autorisé par le médecin traitant.

I request for myself, or the patient named above the benefits of Quebec Hospital Insurance Act. I agree to pay the ☐ daily additional charge for private, semi-private or standard room. I authorize the institution, as well as the attending physician(s) or consultants(s), to supply the Department of Social Affairs with all necessary information concerning this hospitalization. I assume full financial responsibility for hospitalization following the authorized discharge by attending physician.

Signature du malade ou du garant *Patient's or guarantor's signature* | Témoin *Witness*

1. *Durée du séjour/Length of Stay*
Pouponnière/*Nursery* ☐
Salle/*Ward* ☐
Semi-privé/*Semi-private* ☐
Salle ordinaire/*Standard Room* ☐
Privé/*Private* ☐
Total ☐

2a Prix de journée *Per Diem Rate* $________

2b Jours de congé temporaire ☐

3A. Supplément à payer/*Additional Charges*
jours *days* ____________ $______
jours *days* ____________ $______

3B. [illegible] jours *days* ☐ $______ Total $______

4. Frais de séjour/*Cost for Hospitalization* jours/*days*
facturé au M.A.S. *billed to D.S.A.* ☐ $______
facturé au malade *billed to patient* ☐ $______
facturé à un autre organisme *billed to another organization* ☐ $______
autres frais *other charges* $______
Total $______

19 Nouveau-né à l'établissement *New-born in the institution* | oui *yes* ☐ non *no* ☐ | Poids à la naissance *Weight at Birth* | Sortie *Discharge* | Âge de la grossesse *Length of pregnancy*

20 Diagnostic (voir directives)/*Diagnosis (see instructions)* | Médecin-*Physician*

21 Autre diagnostic ou complication/*Other Diagnosis or Complication* | [illegible] ☐

22 Opération | Date | Chirurgien-*Surgeon*

23 Anesthésie *Anesthesia* Gén. Rég. | Traitement/*Treatment*: médical | chir./surg. | physio. | radioth. | autre/*other* | Jrs pré-op. *Pre-op. Days*

24 Renseignements supplémentaires/*Additional Information* | Transféré à/*Transferred to* | Date *Date*

25 Je certifie que le malade a reçu les services indiqués./*I certify that this patient has received the above mentioned services.*
Signature de la personne autorisée/*Signature of authorized person*

M.A.S.
1 D.S.A.

LA LOI PRÉVOIT DES PEINES EN CAS DE FAUSSE DÉCLARATION OU DE REFUS DE REMPLIR CETTE DEMANDE.
PENALTIES ARE PROVIDED UNDER THE ACT FOR FALSE STATEMENTS OR REFUSAL TO COMPLETE THIS FORM

Gouvernement du Québec
Ministère des Affaires Sociales
(Assurance-Hospitalisation)

Code de l'établissement / Institution code

N° dossier antérieur / Previous file No. | An-Year | N° d'inscription / Inscription No.

1 Établissement-Institution

2 Nom de fille ou nom du conjoint-Maiden Name or Name of Spouse

3 Nom du père / Father's Name | Nom de fille de la mère / Mother's Maiden Name

4 Adresse antérieure si moins de 3 mois à l'adresse ci-dessus / Former Address if less than 3 months at the above address | Date du changement / Date of change | Code postal | Code municipal

5 Occupation du malade-Patient's Occupation

Employeur-Employer | Adresse-Address | Téléphone

Date d'admission / Date of Admission | Chambre n° / Room No. | N° dossier médical / Medical File No.

Nom / Name | Prénoms / Surnames

Adresse / Address

Date de naissance / Date of Birth | Âge | Sexe / Sex | N° téléphone / Telephone No.

Médecin traitant / Attending Physician

N° d'ass. maladie / Health Ins. No.

6 Code de référence-Reference Code | État civil / Civil Status | [illegible] | [illegible] | [illegible] | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

7 Accident: Code | Date | Heure-Time | Arrivée / Arrival ▶ | Date | Heure-Time | Date du congé / Date of Final Visit ▶ | Service

8 Répondant ou assurance / Guarantor or Insurance ▶ Nom-Surname | Prénoms-Given Names | Adresse-Address | Téléphone

9 Employeur du répondant / Guarantor's Employer ▶ Nom-Name | Adresse-Address | Téléphone

10 Diagnostic final-Final Diagnosis | Médecin traitant / Attending Physician

Opération(s)

J'autorise les professionnels de cet établissement à faire les examens et traitements nécessaires et à fournir au Ministère des Affaires Sociales les renseignements pertinents sur les services reçus.

I authorize the professionals of this institution to make the necessary examinations and treatments and to release the pertinent information to the Department of Social Affairs.

Date: ____________ ____________ ____________

Signature du malade ou garant / Patient's or Guarantor's Signature

Témoin / Witness

HISTOIRE DE CAS ET NOTES D'ÉVOLUTION - *CASE HISTORY AND PROGRESS REPORT*

11

Genre d'accident ____________

Type of Accident ____________

Date

**RÉGIE DE
L'ASSURANCE-MALADIE
DU QUÉBEC**

À L'USAGE DE LA RÉGIE *FOR THE RÉGIE USE*
DOSSIER - *FILE*

DEMANDE DE RENSEIGNEMENTS - *INQUIRY*

NOM ET ADRESSE - *NAME AND ADDRESS*

Demeurez-vous toujours à l'adresse indiquée au début de la présente formule? Si non, inscrivez ici votre nouvelle adresse.
Do you still live at the address shown on this form? If not, write in your new address here.

VOTRE NUMÉRO DE TÉLÉPHONE - *YOUR TELEPHONE NUMBER*

RÉSIDENCE - *AT HOME*	LIEU DE TRAVAIL - *AT WORK*

À L'USAGE DE L'HÔPITAL - *FOR THE HOSPITAL USE ONLY*

ÉTABLISSEMENT *INSTITUTION*	ADMISSION *ADMISSION*	DATE D'ADMISSION *DATE ADMITTED*	HOSPITALISATION *HOSPITALIZED*	CLINIQUE *OUT PATIENT*
DATE DE L'ACCIDENT *DATE OF THE ACCIDENT*	NO D'ASSURANCE-MALADIE *HEALTH INSURANCE NO*			DATE DE NAISSANCE *DATE OF BIRTH*

BLESSURE OU MALADIE - *INJURY OR ILLNESS*

1 NO D'ASSURANCE-MALADIE S'IL N'EST PAS INSCRIT CI-HAUT
HEALTH INSURANCE NUMBER IF NOT ALREADY SHOWN ABOVE

Avez-vous été victime d'une blessure ou d'une maladie causées par un accident?
Were you the victim of injury or accidental illness?

OUI *YES* ☐ NON *NO* ☐

Si vous répondez NON, retournez cette formule aussitôt sans répondre aux autres questions.
If your answer is NO, return this form immediately without answering the remaining questions.

LIEU DE L'ACCIDENT - *PLACE OF ACCIDENT*

2
1. AU TERRAIN DE JEUX, PARC, OU CENTRE DE LOISIR *AT THE PLAYGROUND PARK OR SPORTS CENTER* ☐
2. À LA FERME *ON THE FARM* ☐
3. À VOTRE DOMICILE *AT YOUR HOME* ☐
4. SUR LA ROUTE *ON ROAD* ☐
5. AU TRAVAIL *AT WORK* ☐
6. AUTRE *OTHER* ☐

Si vous répondez à l'une de ces possibilités, retournez la formule sans répondre aux autres questions. *If your answer to one of these questions is YES, return this form without answering any further question*

Si vous répondez à l'une de ces possibilités, remplissez les sections appropriées. *If your answer to one of these questions is YES, fill in all pertinent answers.*

ACCIDENT DE LA ROUTE - *ROAD ACCIDENT*

3 ÉTIEZ-VOUS? *WERE YOU?* PIÉTON *PEDESTRIAN* ☐ PASSAGER *PASSENGER* ☐ CONDUCTEUR *DRIVER* ☐

1er VÉHICULE *1st VEHICLE* CONDUCTEUR *DRIVER*	NOM/*NAME*		2e VÉHICULE *2nd VEHICLE* CONDUCTEUR *DRIVER*	NOM/*NAME*	
	ADRESSE/*ADDRESS*			ADRESSE/*ADDRESS*	
PROPRIÉTAIRE *OWNER*	NOM/*NAME*		PROPRIÉTAIRE *OWNER*	NOM/*NAME*	
	ADRESSE/*ADDRESS*			ADRESSE/*ADDRESS*	
ASSUREUR DU PROPRIÉTAIRE *OWNER'S INSURER*	NOM/*NAME*		ASSUREUR DU PROPRIÉTAIRE *OWNER'S INSURER*	NOM/*NAME*	
	ADRESSE/*ADDRESS*			ADRESSE/*ADDRESS*	
	NO DE LA POLICE D'ASSURANCE *INSURANCE POLICY NO.*	DOSSIER NO - *FILE NO.*		NO DE LA POLICE D'ASSURANCE *INSURANCE POLICY NO*	DOSSIER NO - *FILE NO*

ACCIDENT AU TRAVAIL - *ACCIDENT AT WORK*

4 NOM ET ADRESSE DE VOTRE EMPLOYEUR - *NAME AND ADDRESS OF YOUR EMPLOYER*	DATE DE L'ACCIDENT *DATE OF THE ACCIDENT*

AUTRE GENRE D'ACCIDENT - *OTHER TYPE OF ACCIDENT*

5 NOM ET ADRESSE DE LA PERSONNE QUE VOUS CONSIDÉREZ COMME RESPONSABLE - *NAME AND ADDRESS OF THE PERSON YOU HOLD RESPONSIBLE*

AVOCAT - *LAWYER*

6 Avez-vous retenu les services d'un avocat? *Have you hired a lawyer?* OUI *YES* ☐ NON *NO* ☐	NOM ET ADRESSE - *NAME AND ADDRESS*	TÉLÉPHONE - *PHONE*

7 AVEZ-VOUS ÉTÉ PAYÉ? *WERE YOU COMPENSATED?* OUI *YES* ☐ NON *NO* ☐	SI OUI, PAR QUI *IF YES, BY WHOM*

AUTRES RENSEIGNEMENTS DEMANDÉS AU VERSO - *SEE QUESTIONS ON REVERSE SIDE*

LIEU DES SOINS - *PLACE OF TREATMENT*

8

Nom du lieu ou vous avez reçu les soins *Name of place where you received treatment*	HÔPITAL *IN-PATIENT*	CLINIQUE EXTERNE *OUT-PATIENT*	CABINET DU PROF DE LA SANTÉ *HEALTH PROF OFFICE*	DATE - *DATE*
	☐	☐	☐	
	☐	☐	☐	
	☐	☐	☐	

DESCRIPTION DE VOS BLESSURES - *DESCRIPTION OF INJURIES*

9

TRAITEMENTS FUTURS - *PROPOSED TREATMENT*

10

DESCRIPTION DE L'ACCIDENT - *DESCRIPTION OF ACCIDENT*

11

DATE - *DATE*	HEURE - *TIME*	LIEU - *PLACE*	RAPPORT DE LA POLICE - *POLICE REPORT* ☐ OUI - *YES* ☐ NON - *NO*

NOM DES AUTRES VICTIMES - *NAME OF OTHER VICTIMS*

DESCRIPTION DÉTAILLÉE DE L'ACCIDENT - *DETAILED DESCRIPTION OF ACCIDENT*

LES RENSEIGNEMENTS FOURNIS SONT CONFIDENTIELS - *ALL INFORMATION GIVEN WILL BE TREATED AS CONFIDENTIAL*

NOM DE LA PERSONNE QUI A COMPLÉTÉ LA DEMANDE DE RENSEIGNEMENTS *NAME OF PERSON WHO COMPLETED THIS FORM*	DATE

RÉGIE DE
L'ASSURANCE-MALADIE
DU QUÉBEC

DOSSIER

HISTORIQUE DES ACTES MÉDICAUX

ORIGINE	COMPOS	NUMÉRO ASSURANCE-MALADIE	DERNIER CHANG.	DATE DU DERNIER CHANGEMENT	DATE
010			0	000000	10 JUI 75

DATE D'ENVOI DU QUESTIONNAIRE	RÉPONSE	TIERS RESPONSABLE
25 P /15 11 74	OUI	OUI

DATE D'ENVOI DU FOLLOW-UP	RÉPONSE	STATUT DOS
	NON	03

ACCIDENT

DATE	HEURE	LIEU	TYPE ACC.	RAPPORT DE POLICE	AVOCAT	ASSURANCE	COUVERT C.A.T.	REHOSP. REQUISE	VISITES SUBSEQ.
13SEP74	0715	AUCUN	00	OUI	NON	NON	NON	OUI	NON

STATUT MONÉTAIRE

	DÉBOURSÉS	RECEVABLES	DÉLAISSÉS	ENCAISSÉS
R.A.M.Q.	447.00	346.00	0.00	0.00
A.H.	0.00	0.00	0.00	0.00
TOTAL	447.00	346.00	0.00	0.00

DÉTAIL DES RÉCLAMATIONS

PROF.	NO CONT. INTERNE NO ADMIS. NO DOSSIER	NO. EXT.		(1) CODE ACTE	(2) DATE ACTE	(3) DIAG.	DATE ADMIS.	DATE SORTIE	OPÉR.	CAT.	(4) ÉTABLIT.	(5) HON. R.A.M.Q.	JOURS A.H
--	4262107865	09662	1	00056	04256	0996	71000	71000			02623	950	
	4262107865	09662	1	01323	04256	0996	71000	71000			02623	2600	
	4262107865	09662	1	00492	04256	0996	71000	71000			02623	250	
	4262107865	19661	1	01320	04256	0996	71000	71000			02623	900	
	4269107708	51338	1	00278	04263	099[illegible]	71000	71000			02031	5000	
	4274108354	15122	1	00056	04258	0802	[illegible]1000	71000			02031	950	
	4274108354	15122	1	00492	04258	0802	71000	71000			02031	500	
	4273200478	67253	1	09527	04266	0802	71000	71000			02031	17000	
	4273200478	67253	1	09558	04266	0802	71000	71000			02031	4000	
	4273200478	67253	1	09558	04266	0802	71000	71000			02031	2000	
	4308121005	29539	0	00005	04300	0802	71000	71000			02031	450	
	4295112235	02871	0	00003	04259	0807	71258	71000			02033	350	
	4295112235	02871	0	00003	04260	0807	71258	71000			02033	350	
	4295112235	02871	0	00003	04261	0807	71258	71000			02033	350	
	4295112235	02871	0	00003	04262	0807	71258	71000			02033	350	
	4295112235	02871	0	00003	04263	0807	71258	71000			02033	350	
	4295112235	02871	0	00003	04264	0807	71258	71000			02033	350	
	4295112235	02871	0	00003	04265	0807	71258	71000			02033	350	
	4295112235	02871	0	00003	04266	0807	71258	71000			02033	350	
	4295112235	02871	0	00003	04267	0807	71258	71000			02033	350	
	4295112235	02871	0	00003	04268	0807	71258	71000			02033	350	
	4295112235	02871	0	00003	04269	0807	71258	71000			02033	350	
	4295112235	02871	0	00003	04270	0807	71258	71000			02033	350	
	4295112235	02871	1	00096	04258	0807	71258	71000			02033	1700	
	4294114730	73822	0	00003	04257	0802	71255	71256			02623	350	

Page

Total stay in private ward 14
Total length of stay 14
Total hospital expenses 14
Institution's code for the 1st hospitalization 7
Missing hospital forms 7

- Codification of injuries
Information source of injury 1 8
CIMA code of injury 1 9
Region of injury 1 8
Type of injury 1 9
System affected by injury 1 10
Severity of injury 1 10

(Note: the variables describe injuries 1 to 6)

- Total injury severity
+AIS injury region 11
+Type of injury in the AIS region 9
+Severity of injury in the AIS region 10
Total severity of injuries 11
Number of injuries sustained by the victim 12
Number of regions injured 13

+: the variables describe injuries in the AIS regions 1,2, and 3)

- Treatment at out-patient clinic or physician's office
Treatment at out-patient clinic 12
Number of visits to out-patient clinic -
Type of treatment at out-patient clinic 12
Treatment at physician's office 12
Number of visits to the physician's office -
Type of treatment at the physician's office 12
Number of procedures 13

APPENDIX IV

Description of the "ACCIDENT"
and "VICTIMS" files

	Page
- Treatment summary	
Date of the first intervention	14
Date of the last intervention	14
Length of treatment (in days)	14
Number of services rendered by the physician	13
Number of diagnoses made by the physician	13
Costs of services rendered by the physician	15
Missing services (number)	13
Costs of missing services	15
Total costs of treatment (medical services)	15
Costs of the out-patient clinic	15
- Main characteristics of the accident	
Type of accident	22
Severity of the accident	23
Nature of the collision	23
Region of the accident	21
Type of region	29
Vehicle occupied by the victim	19
Type of vehicle	26
Year of vehicle	27
Speed limit	26
- Variables collected for the TPS	
Agent's code	18
Date of the accident	18
Date of the claim	19
Date of the payment	19
Value of payment made (Hosp.I)	16
Value of payment (H.I.)	16
Medical expenses according to file	17
Medical expenses according to case history	17

Description of the "VICTIMS" file

Ref.* (page)	Description of the box	Variable	Record No.	Sign No.	Position	
1	Victims number	NØVIC1	1	04	01	04
-	Card number	NØSEQ1	1	02	05	06
1	Accident number	NØACC	1	04	07	10
1	Number of file at TPLS	NØSTR	1	07	15	21
2	Type of file	TYPDØS	1	01	22	22
2	State of the file	ETADØS	1	01	23	23
2	Victim's age	AGE	1	02	24	25
-	Date of birth	JRNAIS	1	02	26	27
-	Month of birth	MSNAIS	1	02	28	29
-	Year of birth	ANNAIS	1	02	30	31
3	Victim's sex	SEXE	1	01	32	32
3	Marital status of victim	ETACIV	1	01	33	33
3	Profession	PROFES	1	02	34	35
4	Category of road user	CATUSA	1	01	36	36
4	Driving experience	EXPER	1	02	37	38
4	Restriction on driver's licence	RESTRIC	1	01	39	39
21	Residence	RESID	1	02	40	41
5	Victim's status	STATUT	1	01	42	42
6	Injury severity code acc. to police	CØDE	1	01	43	43
7	State of victim on arrival at hospital	ETAVIC	1	01	44	44
7	Delay bet. accident plus hospital	DELAI	1	03	45	47
-	Number of hospitalizations	NBHOSP	1	01	50	50
14	Total stay: ward	SEJSAL	1	03	51	53
14	Total stay: semi private	SEJSPR	1	03	54	56
14	Total stay: ordinary ward	SEJSALØ	1	03	57	59
14	Total stay: private room	SEJPRIV	1	03	60	62
14	Total length of stay	SEJTØT	1	03	63	65
14	Total hospital costs	CTTØHØS	1	05	66	70
7	Institution's code (1st hospitalization)	ETABLIS	1	05	71	75
7	Missing hospitalization form					

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* The reader will find a description of the variables on pp. 205-233. The pagination above should be ignored.

Ref. (page)	Description of the box	Variable	Record No.	Sign No.	Position	
1	Victim's number	NØVIC2	2	04	01	04
-	Card number	NØSEQ2	2	02	05	06
8	Informatinn source: Injury 1	INFBL1	2	01	07	07
9	CIMA code : " "	CIMA1	2	04	08	11
8	Region injured : " "	REGBL1	2	02	12	13
9	Type : " "	TYPBL1	2	02	14	15
10	System affected : " "	SYSBL1	2	01	16	16
10	AIS severity : " "	AISBL1	2	01	17	17
8	Information source: Injnry 2	INFBL2	2	01	18	18
9	CIMA code : " "	CIMA2	2	04	19	22
8	Region injured : " "	REGBL2	2	02	23	24
9	Type : " "	TYPBL2	2	02	25	26
10	System affected : " "	SYSBL2	2	01	27	27
10	AIS severity : " "	AISBL2	2	01	28	28
8	Information sonrce: Injury 3	INFBL3	2	01	29	29
9	CIMA code : " "	CIMA3	2	04	30	33
8	Region injured : " "	REGBL3	2	02	34	35
9	Type : " "	TYPBL3	2	02	36	38
10	System affected : " "	SYSBL3	2	01	38	38
10	AIS severity : " "	AISBL3	2	01	39	39
8	Information source: Injury 4	INFBL4	2	01	40	40
9	CIMA code : " "	CIMA4	2	04	41	44
8	Region injured : " "	REGBL4	2	02	45	46
9	Type : " "	TYPBL4	2	02	47	48
10	System affected : " "	SYSBL4	2	01	49	49
10	AIS severity : " "	AISBL4	2	01	50	50
8	Information source: Injury 5	INFBL5	2	01	51	51
9	CIMA code : " "	CIMA5	2	04	52	55
8	Region injured : " "	REGBL5	2	02	56	57
9	Type : " "	TYPBL5	2	02	58	59
10	System affected : " "	SYSBL5	2	01	60	60
10	AIS severity : " "	AISBL5	2	01	61	61

Ref. (page)	Description of the box	Variable	Record No.	Sign No.	Position	
8	Information source: Injury 6	INFBL6	2	01	62	62
9	CIMA code : " "	CIMA6	2	04	63	66
8	Region injured : " "	REGBL6	2	02	67	68
9	Type : " "	TYPBL6	2	02	69	70
10	System affected : " "	SYSBL6	2	01	71	71
10	AIS severity : " "	AISBL6	2	01	72	72
1	Victim's number	N0VIC3	3	04	01	04
-	Card number	N0SEQ3	3	02	05	06
11	AIS Region: Injury region 1	REGBR1	3	01	07	07
9	Type : " " "	TYPBR1	3	02	08	09
10	AIS severity: " " "	AISBR1	3	01	10	10
11	AIS Region: Injury region 2	REGBR2	3	01	11	11
9	Type : " " "	TYPBR2	3	02	12	13
10	AIS severity: " " "	AISBR2	3	01	14	14
11	AIS Region: Injury region 3	REGBR3	3	01	15	15
9	Type : " " "	TYPBR3	3	02	16	17
10	AIS severity: " " "	AISBR3	3	01	18	18
12	Total severity of injuries	ISS	3	02	19	20
12	Number of injuries sustained	NBBLES	3	01	21	21
13	Number of regions injured	NBREG	3	01	22	22
12	Treatment in out-patient clinic	CLINEX	3	01	23	23
-	No. of visits to out-patient clinic	NBCLIN	3	02	24	25
12	Type of treatment at out-patient clinic	TRCLIN	3	01	26	26
12	Treatment in physician's office	CABIN	3	01	27	27
-	No. of visits to physician's office	NBCAB	3	02	28	29
12	Type of treatment at physician's office	TRCAB	3	01	30	30
13	Number of operations	NB0PE	3	01	31	31
14	Date of 1st procedure	ACTE1	3	05	32	36
14	Date of last procedure	ACTED	3	05	37	41
14	Length of treatment (days)	DURTR	3	03	42	44
13	Number of services rendered by physician	NBACT	3	03	45	47
13	Number of diagnoses made by physician	NBDIAG	3	02	48	49

Ref. (page)	Description of the box	Variable	Record No.	Sign No.	Position	
15	Costs of services rendered by physician	CTACT	3	05	50	54
13	Number of services missing	NBACTM	3	02	55	56
15	Costs of missing services	CTACTM	3	05	57	61
15	Total costs of treatment	CTTØTR	3	05	62	66
15	Out-patient clinic costs	CTCLIN	3	03	67	69
1	Victim's number	NØVIC4	4	04	01	04
-	Card number	NØSEQ4	4	02	05	06
22	Type of accident	GENACC	4	02	07	08
23	Severity of the accident	GRAVACC	4	01	09	09
23	Nature of the collision	NATCØL	4	01	10	10
21	Region of the accident	REGACC	4	02	11	12
29	Type of region	TYPREG	4	01	13	13
19	Vehicle occupied by victim	VEHV	4	01	14	14
26	Type of vehicle	TYPV	4	02	15	16
27	Year of vehicle	ANV	4	02	17	18
26	Speed limit	VITESSE	4	02	19	20
18	Code of the TPS agent	AGENT	4	03	21	23
18	Date of the accident	DATEACC	4	05	24	28
19	Data of claim	DATRECL	4	05	29	33
19	Date of payment	DATRECØ	4	05	34	38
16	Value of Hosp. Ins. payment	RECØAH	4	05	39	43
16	Value of Health Ins.payment	RECØAM	4	05	44	48
17	Medical expenses acc. to file	FMDØS	4	05	49	53
17	Medical expenses acc. to case history	FMHIS	4	05	54	58
1	Victim's number	NØVIC5	5	04	01	04
-	Card number	NØSEQ5	5	02	05	06
-	Number of the hospitalization (1st)	NØHØSP1	5	01	07	07
8	Information source 1st hospitalization	INFØH1	5	01	08	08
-	Day of admission	JRENTH1	5	02	09	10
-	Month of admission	MSENTH1	5	02	11	12
-	Year of admission	ANENTH1	5	02	13	14
-	Day of discharge	JRSØRH1	5	02	15	16
-	Month of discharge	MSSØRH1	5	02	17	18

Ref. (page)	Description of the box	Variable	Record No.	Sign No.	Position	
-	Year of discharge	ANS0RH1	5	02	19	20
14	Stay in ward	SRSALH1	5	03	21	23
14	Stay in semi private ward	SRSPH1	5	03	24	26
14	Stay in ordinary ward	SRS0H1	5	03	27	29
14	Stay in private ward	SRPRH1	5	03	30	32
14	Total stay	SRT0TH1	5	03	33	35
17	Per diem	DIEMH1	5	03	36	38
17	Hospitalization expenses	CTHH1	5	05	39	43
18	Other expenses	CTAH1	5	05	44	48
18	Total hospitalization expenses	CTTH1	5	05	49	53
11	Main diagnosis	DIAGH1	5	04	54	57
7	Code of the institution	ETABH1	5	05	58	62
12	Type of treatment	TRAIH1	5	01	63	63
6	Accident code acc. to AH-101	CDACCH1	5	02	64	65
1	Victim's number	N0VIC6	6	04	01	04
-	Card number	N0SEQ6	6	02	05	06
-	Hospitalization number (2nd)	N0H0SP2	6	01	07	07
8	Information source 2nd hospitalization	INF0H2	6	01	08	08
-	Day of admission	JRENTH2	6	02	09	10
-	Month of admission	MSENTH2	6	02	11	12
-	Year of admission	ANENTH2	6	02	13	14
-	Day of discharge	JRS0RH2	6	02	15	16
-	Month of discharge	MSS0RH2	6	02	17	18
-	Year of discharge	ANS0RH2	6	02	19	20
14	Stay in ward	SRSALH2	6	03	21	23
14	Stay in semi private ward	SRSPH2	6	03	24	26
14	Stay in ordinary	SRS0H2	6	03	27	29
14	Stay in private ward	SRPRH2	6	03	30	32
14	Total stay	SRT0TH2	6	03	33	35
17	Per diem	DIEMH2	6	03	36	38

Ref. (page)	Description of the box	Variable	Record No.	Sign No.	Position	
17	Hospitalization expenses	CTHH2	6	05	39	43
18	Other expenses	CTAH2	6	05	44	48
18	Total hospitalization expenses	CTTH2	6	05	49	53
11	Main diagnosis	DIAGH2	6	04	54	57
7	Institution's code	ETABH2	6	05	58	62
12	Type of treatment	TRAIH2	6	01	63	63
6	Accident code according to the AH-101	CDACCH2	6	02	64	65
1	Victim's number	N0VIC7	7	04	01	04
-	Card number	N0SEQ7	7	02	05	06
-	Number of hospitalization (3rd)	N0H0SP3	7	01	07	07
8	Information source 3rd hospitalization	INF0H3	7	01	08	08
-	Day of admission	JRENTH3	7	02	09	10
-	Month of admission	MSENTH3	7	02	11	12
-	Year of admission	ANENTH3	7	02	13	14
-	Day of discharge	JRS0RH3	7	02	15	16
-	Month of discharge	MSS0RH3	7	02	17	18
-	Year of discharge	ANS0RH3	7	02	19	20
14	Stay in ward	SRSALH3	7	03	21	23
14	Stay in semi private ward	SRSPH3	7	03	24	26
14	Stay in ordinary ward	SRS0H3	7	03	27	29
14	Stay in private ward	SRPRH3	7	03	30	32
14	Total stay	SRT0TH3	7	03	33	35
17	Per diem	DIEMH3	7	03	36	38
17	Hospitalization expenses	CTHH3	7	05	39	43
18	Other expenses	CTAH3	7	05	44	48
18	Total hospitalization expenses	CTTH3	7	05	49	53
11	Main diagnosis	DIAGH3	7	04	54	57
7	Institution's code	ETABH3	7	05	58	62
12	Type of treatment	TRAIH3	7	01	63	63
6	Accident code according to AH-101	CDACCH3	7	02	64	65

Ref. (page)	Description of the box	Variable	Record No.	Sign No.	Position	
1	Number of the accident	N0ACC1	1	04	01	04
-	Card number	N0SEQ1	1	02	05	06
1	Accident report number	INF0	1	06	07	12
-	Day of the accident	JRACC	1	02	13	14
-	Month of the accident	MSACC	1	02	15	16
-	Year of the accident	ANACC	1	02	17	18
20	Day of the week	JRSEM	1	01	19	19
21	Time of the accident	HRACC	1	02	20	21
22	Type of accident	GENACC	1	02	22	23
23	Severity of the accident	GRAVACC	1	01	24	24
23	Nature of the collision	NATC0L	1	01	25	25
21	Region of the accident	REGACC	1	02	26	27
29	Type of region	TYPREG	1	01	28	28
23	Localization of the accident	L0CACC	1	02	29	30
24	Road category	CATV0IE	1	02	31	32
24	State of the road surface	ETACHA	1	01	33	33
25	Nature of the road surface	NATCHA	1	01	34	34
25	Type of road surface	ASPCHA	1	01	35	35
25	Weather	TEMPS	1	01	36	36
26	Light	LUMEN	1	01	37	37
26	Speed limit	VITESSE	1	02	38	39
22	Damage to property	D0MPR0	1	03	40	42
-	Number of vehicles involved	VEHIMP	1	02	43	44
26	Type of vehicle 1	TYPV1	1	02	45	46
27	Year of vehicle 1	ANV1	1	02	47	48
27	Damage to vehicle 1	DOMV1	1	01	49	49
28	Movement of vehicle 1	MVTV1	1	02	50	51
28	State of vehicle 1	ETAV1	1	01	52	52
29	Visibility of vehicle 1	VISV1	1	01	53	53
19	Number of occupants vehicle 1	0CCV1	1	02	54	55
26	Type of vehicle 2	TYPV2	1	02	56	57
27	Year of vehicle 2	ANV2	1	02	58	59
27	Damage to vehicle 2	D0MV2	1	01	60	60

Ref. (page)	Description of the box	Variable	Record No.	Sign No.	Position	
28	Movement of vehicle 2	MVTV2	1	02	61	62
28	State of vehicle 2	ETAV2	1	01	63	63
29	Visibility of vehicle 2	VISV2	1	01	64	64
19	Number of occupants in vehicle 2	OCCV2	1	02	65	66
26	Type of vehicle 3	TYPV3	1	02	67	68
27	Year of vehicle 3	ANV3	1	02	69	70
27	Damage to vehicle 3	D0MV3	1	01	71	71
28	Movement of vehicle 3	MVTV3	1	02	72	73
28	State of vehicle 3	ETAV3	1	01	74	74
29	Visibility of vehicle 3	VISV3	1	01	75	75
19	Number of occupants vehicle 3	OCCV3	1	02	76	77
1	Accident number	N0ACC2	2	04	01	04
-	Card number	N0SEQ2	2	02	05	06
26	Type of vehicle 4	TYPV4	2	02	07	08
27	Year of vehicle 4	ANV4	2	02	09	10
27	Damage to vehicle 4	D0MV4	2	01	11	11
28	Movement of vehicle 4	MVTV4	2	02	12	13
28	State of vehicle 4	ETAV4	2	01	14	14
29	Visibility of vehicle 4	VISV4	2	01	15	15
19	Number of occupants in vehicle 4	0CCV4	2	02	16	17
26	Type of vehicle 5	TYPV5	2	02	18	19
27	Year of vehicle 5	ANV5	2	02	20	21
27	Damage to vehicle 5	D0MV5	2	01	22	22
28	Movement of vehicle 5	MVTV5	2	02	23	24
28	State of vehicle 5	ETAV5	2	01	25	25
29	Visibility of vehicle 5	VISV5	2	01	26	26
19	Number of occupants in vehicle 5	0CCV5	2	02	27	28
-	Number of drivers involved	C0NIMP	2	02	29	30
3	Sex of driver 1	SEXC1	2	01	31	31
2	Age of driver 1	AGEC1	2	02	32	33
4	Restriction of driver 1	RESC1	2	01	34	34
4	Experience of driver 1	EXPC1	2	02	35	36

Ref. (page)	Description of the box	Variable	Record No.	Sign No.	Position	
5	Responsability of driver 1	RSPC1	2	01	37	37
3	Sex of driver 2	SEXC2	2	01	38	38
2	Age of driver 2	AGEC2	2	02	39	40
4	Restriction of driver 2	RESC2	2	01	41	41
4	Experience of driver 2	EXPC2	2	02	42	43
5	Responsability of driver 2	RSPC2	2	01	44	44
3	Sex of driver 3	SEXC3	2	01	45	45
2	Age of driver 3	AGEC3	2	02	46	47
4	Restriction of driver 3	RESC3	2	01	48	48
4	Experience of driver 3	EXPC3	2	02	49	50
5	Responsability of driver 3	RSPC3	2	01	51	51
3	Sexe of driver 4	SEXC4	2	01	52	52
2	Age of driver 4	AGEC4	2	02	53	54
4	Restriction of driver 4	RESC4	2	01	55	55
4	Experience of driver 4	EXPC4	2	02	56	57
5	Responsability of driver 4	RSPC4	2	01	58	58
3	Sex of driver 5	SEXC5	2	01	59	59
2	Age of driver 5	AGEC5	2	02	60	61
4	Restriction of driver 5	RESC5	2	01	62	62
4	Experience of driver 5	EXPC5	2	02	63	64
5	Responsability of driver 5	RSPC5	2	01	65	65
1	Number of the accident	N0ACC3	3	04	01	04
-	Card number	N0SEQ3	3	02	05	06
-	Number of people killed	NBTUES	3	01	07	07
-	Number of people injured	NBBLES	3	01	08	08
19	Number of victims	NBVICs	3	01	09	09
19	Vehicle occupied victim 1	VEHV1	3	01	10	10
3	Sex of victim 1	SEXV1	3	01	11	11
2	Age of victim 1	AGEV1	3	02	12	13
6	Injury code victim 1	C0DV1	3	01	14	14
4	Category of user victim 1	CATV1	3	01	15	15
20	File of the TPLS victim 1	D0SV1	3	01	16	16

Ref. (page)	Description of the box	Variable	Record No.	Sign No.	Position	
19	Vehicle occupied victim 2	VEHV2	3	01	17	17
3	Sex of victim 2	SEXV2	3	01	18	18
2	Age of victim 2	AGEV2	3	02	19	20
6	Injury code victim 2	C0DV2	3	01	21	21
4	Category of user victim 2	CATV2	3	01	22	22
20	TPS file victim 2	D0SV2	3	01	23	23
19	Vehicle occupied victim 3	VEHV3	3	01	24	24
3	Sex of victim 3	SEXV3	3	01	25	25
2	Age of victim 3	AGEV3	3	02	26	27
6	Injury code victim 3	C0DV3	3	01	28	28
4	Category of user victim 3	CATV3	3	01	29	29
20	TPS file victim 3	D0SV3	3	01	30	30
19	Vehicle occupied victim 4	VEHV4	3	01	31	31
3	Sex of victim 4	SEXV4	3	01	32	32
2	Age of victim 4	AGEV4	3	02	33	34
6	Injury code victim 4	C0DV4	3	01	35	35
4	Category of user victim 4	CATV4	3	01	36	36
20	TPS file victim 4	D0SV4	3	01	37	37
19	Vehicle occupied victim 5	VEHV5	3	01	38	38
3	Sex of victim 5	SEXV5	3	01	39	39
2	Age of victim 5	AGEV5	3	01	40	41
6	Injury code victim 5	C0DV5	3	01	42	42
4	Category of user victim 5	CATV5	3	01	43	43
20	TPS file victim 5	D0SV5	3	01	44	44
19	Vehicle occupied victim 6	VEHV6	3	01	45	45
3	Sex of victim 6	SEXV6	3	01	46	46
2	Age of victim 6	AGEV6	3	01	47	48
6	Injury code victim 6	C0DV6	3	01	49	49
4	Category of user victim 6	CATV6	3	01	50	50
20	TPS file victim 6	D0SV6	3	01	51	51
19	Vehicle occupied victim 7	VEHV7	3	01	52	52
3	Sex of victim 7	SEXV7	3	01	53	53
2	Age of victim 7	AGEV7	3	01	54	55

Ref. (page)	Description of the box	Variable	Record No.	Sign No.	Position	
6	Injury code victim 7	CØDV7	3	01	56	56
4	Category of user victim 7	CATV7	3	01	57	57
20	TPS file victim 7	DØSV7	3	01	58	58
19	Vehicle occupied victim 8	VEHV8	3	01	59	59
3	Sex of victim 8	SEXV8	3	01	60	60
2	Age of victim 8	AGEV8	3	02	61	62
6	Injury code victim 8	CØDV8	3	01	63	63
4	Category of user victim 8	CATV8	3	01	64	64
20	TPS file victim 8	DØSV8	3	01	65	65
19	Vehicle occupied victim 9	VEHV9	3	01	66	66
3	Sex of victim 9	SEXV9	3	01	67	67
2	Age of victim 9	AGEV9	3	02	68	69
6	Injury code victim 9	CØDV9	3	01	70	70
4	Category of user victim 9	CATV9	3	01	71	71
20	TPS file victim 9	DØSV9	3	01	72	72
1	Number of the accident	NØACC4	4	04	01	04
-	Card number	NØSEQ4	4	02	05	06
20	Number of victim with TPS files	NBSTR	4	01	07	07
1	Number of victim A	NØVICA	4	04	08	11
11	ISS Severity of victim A	ISSVA	4	02	12	13
1	Number of victim B	NØVICB	4	04	14	17
11	ISS Severity of victim B	ISSVB	4	02	18	19
1	Number of victim C	NØVICC	4	04	20	23
11	ISS Severity of victim C	ISSVC	4	02	24	25
1	Number of victim D	NØVICD	4	04	26	29
11	ISS Severity of victim D	ISSVD	4	02	30	31
1	Number of victim E	NØVICE	4	04	32	35
11	ISS Severity of victim E	ISSVE	4	02	36	37
1	Number of victim F	NØVICF	4	04	38	41
11	ISS Severity of victim F	ISSVF	4	02	42	43
1	Number of victim G	NØVICG	4	04	44	47
11	ISS Severity of victim G	ISSVG	4	02	48	49

CARD INDEX

DESCRIPTION OF VARIABLES

	Page[1]
I VICTIMS file	
- Identifying the victim file	
Victim's number	1
Accident number	1
Number of file at the TPS	1
Type of file	2
State of the file	2
- Victim's characteristics	
Age of the victim	2
Date of birth: day	-
month	-
year	-
Sex of victim	3
Marital status of victim	3
Profession of victim	3
Category of road user	4
Driving experience	4
Restriction on the driver's licence	4
Place of residence	21
Victim's status	5
Injury code according to the police	6
*Victim's condition on arrival at hospital	7
*Delay between accident and hospitalization (in hours)	7
- Hospitalization Summary	
Number of hospitalizations	-
Total stay: in ward	14
(in days) in semi private ward	14
in ordinary ward	14

*: Variables concerning in-patient victims only

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[1] The reader will find a description of the variables on pp. 205-233. The pagination above should be ignored.

-*Details of the hospitalization

	Page
Number of the hospitalization	-
Source of information	8
Date of admission (day, month, year)	-
Date of discharge (day, month, year)	-
Stay in ward	14
Stay in semi private ward	14
Stay in ordinary ward	14
Stay in private ward	14
Total stay	14
Per diem	17
Hospitalization expenses	17
Other expenses	18
Total expenses	18
Main diagnosis	11
Institution's code	7
Type of treatment	12
Accident code	6

*: Variables concerning in-patient victims only. The variables describe hospitalizations 1, 2 and 3).

II ACCIDENT file

- Identification of the accident

Number of the accident	1
Number of the INFO accident report	1
Date of the accident: day	-
month	-
year	-
Day of the week	20
Time of accident	21
Type of accident	22
Severity of the accident	23
Nature of the collision	23

	Page
- Accident site	
Area of the accident	21
Type of area	29
Localization of accident site	23
- Environment	
Road category	24
State of road surface	24
Nature of road surface	25
Features of road surface	25
Temperature	25
Light	26
Speed limit	26
- Material damage	
Property damage	22
- Vehicles	
Number of vehicles involved	-
*Type of vehicle 1	26
*Year of vehicle 1	27
*Damage to vehicle 1	27
*Movement of vehicle 1	28
*State of vehicle 1	28
*Visibility of vehicle 1	29
*Number of occupants of vehicle 1	19

(*: Variables used for vehicles 1 to 5 of the accident)

- Drivers	
Number of drivers involved	-
+Sex of driver 1	3
+Age of driver 1	2
+Restriction on driver's licence, driver 1	4
+Driving experience of driver 1	4
+Responsability of driver 1	5

(+: Variables used for drivers 1 to 5)

Page

- Victims

Number of people killed -
Number of people injured -
Number of victims 19
*Vehicle occupied by victim 1 19
*Sex of victim 1 3
*Age of victim 1 2
*Injury code of victim 1 6
*Category of road user for victim 1 4
*File at the TPS, victim 1 20

(*: Variables used for a maximum of 9 victims per accident)

- Victims with liability files

Number of victims with file at the TPS 20
*Number of victim A 1
*ISS Severity for victim A 11

(*: The variables describe the sample's victims; maximum of 7 victims (A to G) per accident)

Description of the variables

Variable: Victim's number

Sequential number assigned to victims of the sample in the victims file, varying from:

- 0001 à 0700 for in-patient victims
- 1000 à 1308 for out-patient victims

Valid for the variables:

- victims file: N0VIC1 to N0VIC7
- accident file: N0VICA à N0VICG

Variable: Accident number

Sequential number assigned to the sample's accidents in the accident file, varying from:

- 001 to 957

Valid for the variables:

- Victims file: N0ACC
- Accident file: N0ACC1 to N0ACC4

Variable: Number of the file at the TPS (N0STR)

Identification number used by the Third Party Liability Service of the Health Insurance Board (for confidential reasons, the complete number is not included in our file)

Variable: Number of the accident report (INF0)

Computerized number assigned to each accident report completed by the police, by the Motor Vehicle Bureau (B.V.A.)

Special codes:

999995: accident outside Quebec
999996: no accident report
999997: accident report not found in the BVA file
999998: city of Montreal accident report: but number not available
999999: Quebec accident report (outside Montreal) but number not available

Variable: State of file (TYPD0S)

Category	Code
- Active	1
- Closed	2
- Undefined	9

Variable: State of file (ETAD0S)

Category	Code
- Complete file	1
- Incomplete file (questionnaire absent)	2
- Incomplete file (accident report missing)	3
- Incomplete file (hospital report missing)	4
- Incomplete file (medical expenses missing)	5
- Incomplete file (2 elements missing)	6
- Undefined	9

Variable: Age

Age indicated in years completed.
Code (99) if age not stated.
Valid for the variables:
- Victim's file : AGE
- Accidents file: AGEC1 to AGEC5, AGEV1 to AGEV9

Variable: Sex

Category	Code
- Male	1
- Female	2
- Undefined	9

Valid for the variables:

- Victims file : SEXE
- Accident file: SEXC1 to SEXC5, SEXV1 to SEXV9

Variable: Victim's marital status (ETACIV)

Category	Code
- Single	1
- Married	2
- Widowed,	3
- Separated, divorced	4
- Undefined	9

Variable: Victim's profession (PR0FES)

See the list of codes for occupations used by the Department of Social Affairs (AH-101)

Code (99) if the profession is not defined

Variable: Category of road users

Category	Code
- Driver of a motor vehicle	1
- Passenger of a motor vehicle	2
- Pedestrian	3
- Cyclist	4
- Motorcycle driver	5
- Motorcycle passenger	6
- Snowmobile driver	7
- Other	8
- Undefined	9

Valid for the variables:
- Victims file : CATUSA
- Accident file: CATV1 to CATV9

Variable: Driving experience

Number of years of driving completed
Code (98) if it is not a driver
Code (99) if the number of years is not defined

Valid for the variables:
- Victims file : EXPER
- Accident file: EXPC1 to EXPC5

Variable: Restriction to driving

Category	Code
- No restriction	1
- Corrective glasses (A)	2
- Day driving only (B)	3
- Periodic medical control (D,E,F,G)	4
- Other medical restrictions (C,H to Y)	5

- Not applicable (x)	8
- Undefined	9

(x): the victim is not a driver, or the driver does not have a licence.

Valid for the variables:
- Victims file : RESTRIC
- Accident file: RESC1 to RESC5

Variable: Responsibility of the driver

Category	Code
- Responsible for the accident	1
- Not responsible for the accident	2
- Undefined	9

Valid for the variables:
- Accident file: RSPC1 to RSPC5

Variable: Victim's status (STATUT)

In-patient victims

Category	Code
Hospitalization less than 24 hours	1
Hospitalization more than 24 hours	2
Death within 24 hours	4
Death after 24 hours	5
Undefined	9

Out-patient victims

Category	Code
Treatment at out-patient clinic only	1
Treatment at physician's office only	2
Treatment at clinic and office	3

	Code
Death within 24 hours	4
Death after 24 hours	5
Undefined	9

Variable: Injury severity code

Severity code attributed to a victim according to the state of his injuries. This code is given by the police on an accident report.

Category	Code
Killed	1
Hospitalized	2
Returned home after treatment	3
No treatment required	4
Not identified	5
*Killed declared to be hospitalized	6
*Killed declared returned home	7
Undefined	9

Valid for the variables:

- Victims file : C0DE
- Accident file: C0DV1 to C0DV9

*: Category used only in the ACCIDENTS file

Variable: Accident code

Code used by the Department of Social Affairs on the hospital report (AH-101) or out-patient department form (AH-85)

Category	Code
Snowmobiles	10
Automobile	11
Truck or commercial transport	12
Public transport	13
Other motor vehicles	14
Animal-drawn vehicle	15

Category	Code
Dump-trucks	16
Other	17
Undefined	19

Variable: State of the victim on arrival at the hospital (ETAVIC)

Category	Code
Conscious	1
Unconscious	2
Not applicable	0
Undefined	9

Variable: Delay between accident and hospitalization (DELAI)

Delay indicated in hours completed
Code (998) if delay is more than 41 days
Code (999) if delay is undefined

Variable: Institution's code

See the Directory of Physicians, Dentists and other institutions from the Q.H.I.B.

Valid for the variables:
- Victims file: ETABLIS, ETABH1 to ETABH3

Variable: Missing hospitalization forms (FØRMUL)

The number was written, or (0) if there were none missing
Code (9) if the number cannot be defined

Variable: Source of information for an injury

Category	Code
Hospital report AH-101	1
Questionnaire to the victim	2
QHIB form	3
CPQ-1 accident report	4
Other	5
Undefined	9

Valid for the variables:

- Victims file: INFBL1 to INFBL6
  INFOH1 to INFOH3

Variable: Injury region

Category	Code
General	1
Head	2
Face	3
Neck	4
Chest	5
Abdomen	6
Shoulder	7
Upper limb	8
Pelvis	9
Lower limb	10
Undefined	19

Valid for the variables:

- Victms files: REGBL1 to REGBL6

Variable: CIMA injury code

This is the International Classification of Diseases, Adapted (8th edition).

Valid for the variables:
- Victims file: CIMA1 to CIMA6

Variable: Type of injury

Category	Code
Concussion	1
Simple fracture	2
Open fracture/with displacement/comminutive	3
Undefined fracture	4
Laceration, cut, tear	5
Contusion, abrasion, scratches, bruises	6
Sprain, dislocations, pressure	7
Pain, stiffness, sensitiveness	8
Lesion, wound	9
Luxation	10
Burns	11
Bleeding	12
Wrench, extraction	13
Rupture	14
Crushing, breaking	15
Perforation	16
Obstruction	17
Amputation	18
Other	19
Haemothorax	20
Pneumothorax	21
Traumatic shock (emotional)	29
Undefined	99

Valid for the variables:

- Victims file: TYPBL1 to TYPBL6
  TYPBR1 to TYPBR3

Variable: **System affected by the injury**

Category	Code
Skeletal	1
Digestive	2
Nervous	3
Cardio-vascular	4
Urino-genital	5
Respiratory	6
Muscular	7
Skin, Nails, Hair	8
Undefined	9

Valid for the variables:

- Victims file: SYSBL1 to SYSBL6

Variable: **Injury severity**

Category	Code
No injury	0
Minor	1
Moderate	2
Severe (not life-threatening)	3
Serious (life-threatening)	4
Critical (survival uncertain)	5
Maximum (survival impossible)	6
Unknown	9

* These are the severity codes of the abbreviated (AIS) scale. (Abbreviate Injury Scale)

Valid for the variables:

Victims file: AISBL1 to AISBL6, AISBR1 to AISBR3

Variable: AIS injury region*

Category	Code
General	1
Head and neck	2
Face	3
Chest	4
Abdomen	5
Extremities	6
Undefined	9

* Regrouping of regions according to the AIS scale (Abbreviated Injury Scale)

Valid for the variables:

- Victims file: REGABR1 to REGABR3

Variable: Total of injuries

Index of total severity of injuries (ISS: Injury Severity Score)
Code (99) if undefined.

Valid for the variables:

- Victims file : ISS
- Accident file: ISSVA to ISSVG

Variable: Main Diagnosis

The CIMA code was written as indicated on the hospital report

Valid for the variables:

- Victims file: DIAGH1 to DIAGH3

Variables: Treatment in out-patient clinic (CLINEX)
Treatment at physician's office (CABIN)

Category	Code
Yes	1
No	2
Undefined	9

Variable: Type of treatment (TRAIH1 to TRAIH3)

Category	Code
Under observation only	1
Medical treatment (minor intervention included)	2
Closed intervention (cost)	3
Open intervention (surgery)	4
Undefined	9

Variables: Type of treatment at out-patient clinic (TRCLIN)
Type of treatment at physician's office (TRCAB)

Category	Code
No visit	0
Under observation only	1
Medical treatment	2
Closed intervention	3
Open intervention	4
Undefined	9

Variable: Number of injuries sustained (NBBLES)

Number of injuries identified from different sources of the file: Code (9) if undefined.

Variable: Number of regions injured (NBREG)

Number of AIS regions injured, according to the Abbreviated Injury Scale.

Code (9) if undefined.

Variable: Number of operations (NB0PE)

Number of surgical interventions (minor or major)

Code (9) if undefined.

Variable: Number of procedures performed by the physician (NBACT)

Total number of procedures performed by the physician, evaluated from the Q.H.I.B. case history, from the AH-101 form and other sources of the file.

Code (999) if undefined.

Variable: Number of diagnoses performed by the physician (NBDIAG)

Total number of diagnoses performed by the physician, evaluated from the Q.H.I.B. case history, from the AH-101 form and other sources of the file.

Code (99) if undefined.

Variable: Number of procedures missing (NBACTM)

Number of procedures performed by the physicians but not recorded in the Q.H.I.B. case history.

Code (99) if undefined.

Variables: The duration

- Date of the first procedure (ACTE1)
- Date of the last procedure (ACTED)

Calendar date of the first and last procedure performed by the physician relating to the accident.

Code (99999) if undefined.

Variables: The duration

*Total stay in ward (SEJSAL)
*Total stay in semi private ward (SEJSPR)
*Total stay in ordinary ward (SEJSAL0)
*Total stay in private ward (SEJPRIV)
*Total duration of stay (SEJT0T)
Total duration of treatment (DURTR)
*Stay in ward during the 1st, 2nd, 3rd hospitalization (SRSALH1 to SRSALH3)
*Stay in semi private, " " (SRSPH1 to SRSPH3)
*Stay in ordinary ward, " " (SRS0H1 to SRS0H3)
*Stay in private ward, " " (SRPRH1 to SRPRH3)
*Total stay, " " (SRT0TH1 to SRT0T[illegible]3)

The duration is indicated in days

Code (999) is used if the duration is not defined

*: These variables only concern in-patient victims

Variables: The costs

Total hospital costs (CTT0H0S)

Total costs incurred for all the hospitalizations undergone by the victim following the accident (the number of hospitalizations if not limited)

Costs of procedures performed by the physician (CTACT)

Costs of procedures enumerated in the case history of care rendered as supplied by the Q.H.I.B.

Costs of missing procedures (CTACTM)

Costs of procedures performed by a physician but absent from the history of care rendered, as supplied by the Q.H.I.B. These costs were traced by using other elements from the Third Party File.

Total treatment costs (CTT0TR)

Total costs of procedures performed by the physician and the missing procedures. (also performed by the physician)

Out-patient clinic costs (CTCLIN)

Total of costs relative to utilization of the clinic (visits) by a road accident victim.

Value of payment from hospital-insurance (REC0AH)

Sum effectively paid by the Third Party (Liable) to the TPS as payment for hospitalization expenses relative to a road accident victim.

Code (00000) indicates that no money was obtained on this account
Code (99999) indicates that the claim was not yet made (active files)
or that it cannot be defined (closed files without claim)
or that an out-patient victim was involved.

Value of payment from the health-insurance (REC0AM)

Sum actually paid by the Third Party (Liable) to the TPS as payment for medical expenses relative to a road accident victim.

Code (00000) indicates that no payment was obtained on this account
Code (99999) indicates that the claim was not yet made (active files)
or that it cannot be defined (closed files without claim).

Medical expenses according to file (FMD0S)

Sum indicated on the file card as total payment from the Q.H.I.B. for medical expenses.

Code (99999) indicates that this sum was not defined.

Medical expenses according to case history(FMHIS)

Sum indicated on the CASE HISTORY card as total payment from the Q.H.I.B. for medical expenses.

Code (99999) indicates that this sum is not defined (the CASE HISTORY card most often being absent).

Daily cost of the first hospitalization (DIEMH1)

Cost of one day's stay in a hospital institution (variable according to the type of hospital)

Valid for the variables DIEMH2 and DIEMH3 (VICTIMS file) relatively to the 2nd or 3rd hospitalization

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Hospitalization costs for the 1st hospitalization (CTHH1)

Total cost of the stay (number of days x daily cost) in a hospital institution (1st hospitalization).

This is a question of cost assumed by the hospital-Insurance.

Valid for the variables CTHH2 and CTHH3 (VICTIMS file) relative to the 2nd or 3rd hospitalization.

Other expenses for the 1st hospitalization (CTAH1)

Sum paid by the victim for costs not insured by the hospital-Insurance (private room, telephone...) during the 1st hospitalization.

Valid for the variables CTAH2 and CTAH3 (VICTIMS file) relative to the 2nd or 3rd hospitalization.

Total expenses of the 1st hospitalization (CTTH1)

Total of expenses relative to the stay (CTHH1) and of other expenses (CTAH1) during the 1st hospitalization.

Valid for the variables CTTH2 and CTTH3 (VICTIMS file) relative to the 2nd and 3rd hospitalization.

Variable: Agent's code (AGENT)

Three-figure code identifying an agent of the Third Party Service.
Code (999) if undefined.

Variable: Date of the accident (DATEACC)

Calendar date (74xxx) of the accident
Code (99999) if undefined.

Variable: Date of the claim (CATRECL)

Calendar date indicating the time when a claim was sent to a Third Party.

Code (99999) if the claim was not yet sent (active files) or if no claim was made (closed files) or if the date cannot be defined.

Variable: Payment date (DATREC0)

Calendar date indicating when the payment for the claim was made by the Third Party (and cashed by the Q.H.I.B.)

Code (99999) if the payment was not yet made (active files) or if no payment was obtained (closed files) or if the amount of the claim cannot be defined.

Variable: Number of occupants of the vehicle (0CCV1 to 0CCV5)

Number estimated from data relative to victims to drivers and to passengers (witnesses)

Code (99) if undefined.

Variable: Number of victims (NBVICS)

Maximum number of 9 victims per accident

Variable: Vehicle occupied by the victim

Number of vehicles involved in the accident, as notified by the police.

Code (8) if it is a pedestrian or a cyclist
Code (9) if undefined

Valid for the variables:

- VICTIMS file VEHV
- ACCIDENT file VEH1 to VEHV1 to VEHV9

Variable: File at the TPS (D0SV1 to D0SV9)

Category	Code
Has a file at the TPS	1
No file at the TPS	2
File at the TPS but not part of the sample	3
Undefined	9

Variable: Number of victims with a file at the TPS (NBSTR)

Number of victims with a file at the TPS and being part of the sample.

Code (9) if undefined.

Variable: Day of the week (JRSEM)

Category	Code
Sunday	1
Monday	2
Tuesday	3
Wednesday	4
Thursday	5
Friday	6
Saturday	7
Undefined	9

Variable: Time of the accident (HRACC)

Category	Code	Category	Code
Midnight to 1 hr	01	12 hrs to 13 hrs	13
1 hr to 2 hrs	02	13 " to 14 "	14
2 hrs to 3 "	03	14 " to 15 "	15
3 " to 4 "	04	15 " to 16 "	16
4 " to 5 "	05	16 " to 17 "	17
5 " to 6 "	06	17 " to 18 "	18
6 " to 7 "	07	18 " to 19 "	19
7 " to 8 "	08	19 " to 20 "	20
8 " to 9 "	09	20 " to 21 "	21
9 " to 10 "	10	21 " to 22 "	22
10 " to 11 "	11	22 " to 23 "	23
11 " to 12 "	12	23 " to 24 "	24
		Undefined	25

Variable: Place of residence (RESID) VICTIMS file
Area of the accident (REGACC) ACCIDENT and VICTIMS file

Category	Code
Lower St-Lawrence-Gaspé	01
Saguenay-Lac St-Jean	02
Quebec City	03
Trois-Rivières	04
Eastern Townships	05
Montreal: north shore Laurentians - Lanaudière	06
Metropolitan Montreal	07
Montreal south shore	08
Outaouais	09
North west	10
North coast	11
New Quebec	12
Outside Quebec	18
Undefined	19

Variable: Type of accident (GENACC) Accident, Victims file

Category	Code
Automobile and Pedestrian	01
" and automobile	02
" and motorcycle	03
" and bicycle	04
" and stationary object	05
" and foreign body, train, animal, milestone, excavation	06
Automobile without collision	07
" and snowmobile	08
" and other vehicle	09
Motorcycle and pedestrian	11
" and motorcycle	13
" and bicycle	14
" and stationary object	15
" and excavation	16
" without collision	17
" and snowmobile	18
" and other vehicle	19
Snowmobile and pedestrian	21
" and stationary object	25
" and foreign body	26
" without collision	27
" and snowmobile	28
" and other vehicle	29
Other vehicle and pedestrian	31
Undefined	99

Variable: Property damage (D0MPR0)

Evaluation by the police of property damage in dollars
Code (998) if damage from $1000. and more
Code (999) if damage is undefined.

Variable: Accident severity (GRAVACC) **File: Accident, Victims**

Category	Code
Fatal declared fatal by police	1
Bodily declared bodily by police	2
Bodily declared material by police	3
Fatal declared physical by police	4
Bodily unreported by police	5
Bodily declared fatal by police	6
Fatal undefined by police	7
Bodily undefined by police	8

(Note: Bodily: with injured victims
Physical: without injured victims)

Variable: Nature of the collision (NATC0L)

Category	Code
Frontal collision	1
Rear collision	2
Lateral collision	3
Without collision	4
Other	5
Not applicable (pedestrian)	8
Undefined	9

Variable: Localization of the accident (LOCACC)

Category	Code
Between intersections	01
Intersections	02
Narrow street	03
Parking lot	04
Bridge	05

Category	Code
Tunnel	06
Viaduct	07
Level crossing	08
Intersection	09
Pedestrian crossing	10
Private entrance	11
Private property or road	12
Other	13
Undefined	19

Variable: Road category (CATV0IE)

Category	Code
Highway	01
Raised road	02
Road with divided surface	03
Three-Lane road	04
Two-Lane road	05
Entrance	06
Exit	07
Public road in residential area	08
Service road	09
Private property or road	10
Other	11
Undefined	19

Variable: State of the road surface (ETACHA)

Category	Code
Dry	1
Wet	2

Category	Code
Muddy	3
Snowy	4
Greasy	5
Icy	6
Other	8
Undefined	9

Variable: Nature of the road surface (NATCHA)

Category	Code
Asphalt	1
Concrete	2
Gravel	3
Earth	4
Other	8
Undefined	9

Variable: Type of road surface (ASPCHA)

Category	Code
Flat surface, straight line	1
Flat surface, curved	2
Hill, straight line	3
Hill, curved	4
Other	8
Undefined	9

Variable: Weather conditions (TEMPS)

Category	Code
Clear	1
Cloudy	2

Category	Code
Fog	3
Rain	4
Snow	5
Drizzle	6
Sleet	7
Other	8
Undefined	9

Variable: Light (LUMEN)

Category	Code
Dawn	1
Daylight	2
Dusk, sunset	3
Night, lighted road	4
Night, unlit road	5
Other	8
Undefined	9

Variable: Speed limit (VITESSE) Accident and Victims file

Speed limit indicated in miles per hour (MPH)
Code (99) if undefined.

Variable: Type of vehicle

Category	Code
Automobile	01
Station wagon	02
Truck	03
Tow-truck	04
Bicycle	05
Taxi	06
Bus	07

Category	Code
Motorcycle	08
Scooter, mobylette, moped	09
Tractor	10
Ambulance	11
School bus	12
Snowmobile	13
Other	17
Not applicable (pedestrian, cyclist)	18
Undefined	19

Valid for the variables:

- Victims file : TYPV
- Accident file: TYPV1 to TYPV5

Variable: Year of the vehicle

We write the last two numbers of the year (vehicle's model)
Code (99) if year is not defined.

Valid for the variables:

- Victims file : ANV
- Accident file: ANV1 to ANV5

Variable: Damages to vehicle (D0MV1 to D0MV5)

Category	Code
Less than $100.	1
$100. - $200.	2
$200. - $500.	3
More than $500.	4
None	5
Undefined	9

Variable: Movement of the vehicle (MVTV1 to MVTV5)

Category	Code
Driving straight ahead	01
Turning left	02
Turning right	03
Reversing	04
Stopped in traffic	05
Stopped or parked on the side	06
Stops on the side	07
Leaves a side parking	08
Makes a U turn	09
Enters a street or a private property	10
Coming out of street or a private property	11
Overtakes	12
Slows down	13
Other	18
Undefined	19

Variable: State of the vehicle (ETAV1 to ETAV5)

Category	Code
No apparent fault	1
Faulty brakes	2
Faulty lights	3
Wrong direction	4
Faulty tires	5
Faulty windshield	6
Other	8
Undefined	9

Variable: Vehicle's visibility (VISV1 to VISV5)

Category	Code
Good	1
Obscured by: trees	2
" " : building	3
" " : embankment	4
" " : stationary vehicle	5
" " : glaring lights	6
" " : hedge	7
Other	8
Undefined	9

Variable: Type of region (TYPREG) File: Accident, Victims

Category	Code
Urban: city streets	1
Urban: urban zones	2
Urban: other urban zones	3
Rural: main roads	4
Rural: secondary roads	5
Rural: other rural roads	6
Undefined	9

APPENDIX V

Data Collection Form

ACCIDENT

IDENTIFICATION OF THE ACCIDENT

Number of the accident $\overline{1}\ \overline{2}\ \overline{3}\ \overline{4}$

Card number $\overline{5}\ \overline{6}$

INFO accident report number $\overline{7}\ \overline{8}\ \overline{9}\ \overline{10}\ \overline{11}\ \overline{12}$

	Code	Col.		Code	Co
Date of accident Day	_ _	13-14	ENVIRONMENT		
Month	_ _	15-16			
Year	_ _	17-18	Road category	_ _	31-32
Day of the week	_	19	Road surface: state	_	33
Time of the accident	_ _	20-21	Road surface: nature	_	34
Nature of accident	_ _	22-23	Road surface: type	_	35
Severity of accident	_	24			
Nature of collision	_	25	Weather	_	36
			Light	_	37
PLACE OF ACCIDENT			Speed limit	_ _	38-39
Accident region	_ _	26-27			
Type of region	_	28			
Accident localization	_ _	29-30	Spaces	_ _ _	40-42

Vehicles

Number of vehicles involved 43 44

	Type of vehicle	Model	Year	Damages	Movement	State of vehicle	Visibility	Number of occupants	
Vehicle 1 col	45 46		47 48	49	50 51	52	53	54 55	
Vehicle 2 col	56 57		58 59	60	61 62	63	64	65 66	
Vehicle 3 col	67 68		69 70	71	72 73	74	75	76 77	END OF CARD 01
Number of the accident	1 2 3 4								
Car number	5 6								
Vehicle 4 col	7 8		9 10	11	12 13	14	15	16 17	
Vehicle 5 col	18 19		20 21	22	23 24	25	26	27 28	

Drivers

Number of drivers involved 29 30

		Sex	Age	Driver's licence restriction	Driving experience	Liability
Driver 1	col.	31	32 33	34	35 36	37
Driver 2	col.	38	39 40	41	42 43	44
Driver 3	col.	45	46 47	48	49 50	51
Driver 4	col.	52	53 54	55	56 57	58
Driver 5	col.	59	60 61	62	63 64	65

END OF CARD 02

Victims

Accident number 1 2 3 4

Card number 5 6

Number of people killed 7

Number of people injured 8

Number of victims 9

		Vehicle occupied	Sex	Age	Injury code	Road user Category	T.P.S. File
Victim 1	column	10	11	12 13	14	15	16
Victim 2	column	17	18	19 20	21	22	23
Victim 3	column	24	25	26 27	28	29	30
Victim 4	column	31	32	33 34	35	36	37
Victim 5	column	38	39	40 41	42	43	44
Victim 6	column	45	46	47 48	49	50	51
Victim 7	column	52	53	54 55	56	57	58
Victim 8	column	59	60	61 62	63	64	65
Victim 9	column	66	67	68 69	70	71	72

END CARD 03

VICTIMS WITH LIABILITY FILES

Accident number 1 2 3 4

Card number 5 6

Number of victims with TPS Files 7

	Number	ISS Severity
Victim A	8 9 10 11	12 13
B	14 15 16 17	18 19
C	20 21 22 23	24 25
D	26 27 28 29	30 31
E	32 33 34 35	36 37
F	38 39 40 41	42 43
G	44 45 46 47	48 49

END OF CARD 04

IN-PATIENT VICTIM

IDENTIFICATION OF VICTIMS FILE

Victim's number	1 2 3 4
Card number	5 6
Accident number	7 8 9 10
TPLS file	11 12 13 14 15 16 17 18 19 20 21
Type of file	22
State of file	23

VICTIM'S CHARACTERISTICS

	CODE	COL.
Age	— —	24-25
Date of birth Day	— —	26-27
Month	— —	28-29
Year	— —	30-31
Sex	—	32
Marital status	—	33
Profession	— —	34-35
Category of road user	—	36
Driving experience	— —	37-38
Restriction on driver's licence	—	39
Place of residence	— —	40-41
Victim's status	—	42
Injury code according to police	—	43
State of victim on arrival at hospital	—	44
Delay between accident and hospitalization (in hours)	— — —	45-47
Spaces	— —	48-49

HOSPITALIZATION SUMMARY

	CODE	COL.
Number of hospitalizations	_	50
Total stay: (days) in ward	_ _ _	51-53
semi private	_ _ _	54-56
ordinary ward	_ _ _	57-59
private	_ _ _	60-62
Total duration of stay	_ _ _	63-65
Total hospitalization expenses	_ _ _ _ _	66-70
Institution's code for 1st hospitalization	_ _ _ _ _	71-75
One or several forms missing?	_	76

END OF CARD 01

INJURIES Classification of injuries

Victim's number 1 2 3 4

Card number 5 6

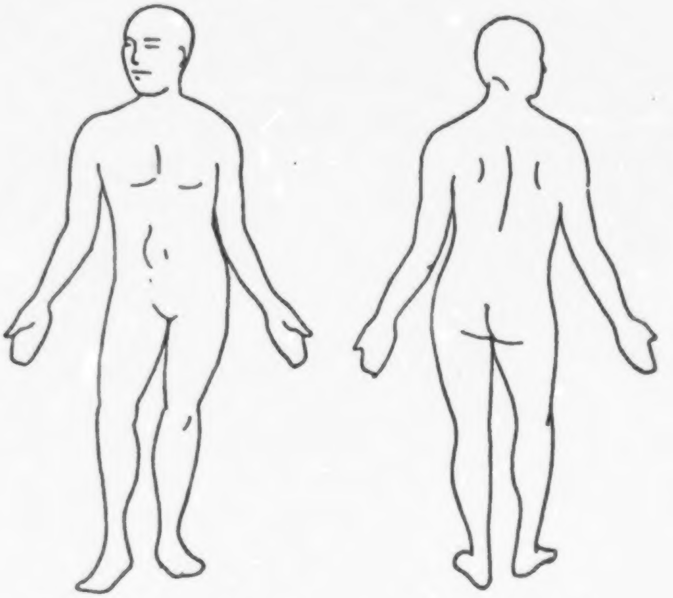
	Information source	CIMA code		Region	Type	System/organ	Severity	Comments
Injury 1 col.	7	8 9 10		11 12	13 14	15	16	
Injury 2 col.	17	18 19 20		21 22	23 24	25	26	
Injury 3 col.	27	28 29 30		31 32	33 34	35	36	
Injury 4 col.	37	38 39 40		41 42	43 44	45	46	
Injury 5 col.	47	48 49 50		51 52	53 54	55	56	
Injury 6 col.	57	58 59 60		61 62	63 64	65	66	
Injury 7 col.	67	68 69 70		71 72	73 74	75	76	

END OF CARD 02

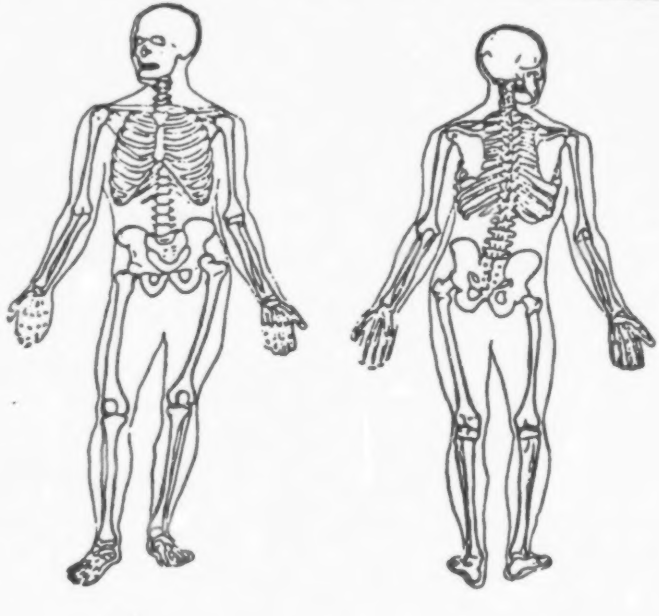
TOTAL INJURY SEVERITY

		TYPE OF INJURIES (INDICATE SEVERITY CODE)																	
AIS Region body	Most severe injury	Concussion	Fracture	Laceration Cut Tear	Contusion Abrasion Scratch Bruise	Sprain Dislocation	Pain	Lesion Wound	Luxation	Burns	Bleeding	Wrench Extraction	Rupture	Crushing Breaking	Perforation	Obstruction	Amputation	Other	Undefined
(1) General																			
(2) Head/neck																			
(3) Face																			
(4) Chest																			
(5) Abdomen																			
(6) Extremities																			
(9) Undefined																			

Indicate localization of injuries



Soft tissue injuries



Skeletal injuries

CALCULATING THE INDEX OF TOTAL SEVERITY (ISS)

Victim's number 1 2 3 4

Car number 5 6

THE THREE MOST INJURED REGIONS

	AID Region	Type of injury	AIS Severity
Injury Region 1	7	8 9	10
Region 2	11	12 13	14
Region 3	15	16 17	18

ISS INDEX: $\sum_{i:1}^{3} (AIS)^{2}_{i}:$ 19 20

Number of injuries sustained by victim 21

Number of body regions injured 22

	CODE	COL.
OUT-PATIENT CLINIC		
Treatment in out-patient clinic	_	23
Number of visits	_ _	24-25
Type of treatment	_	26
PHYSICIAN'S OFFICE		
Treatment at physician's office	_	27
Number of visits	_ _	28-29
Type of treatment	_	30
OPERATIONS		
Number of operations	_	31

LIST OF OPERATIONS

CODE (classification of operations)	CODE (QHIB)
____________	____________
____________	____________
____________	____________
____________	____________
____________	____________
____________	____________

TREATMENT SUMMARY

	CODE	COL.
Date of the first procedure	_ _ _ _ _	32-36
Date of the last procedure	_ _ _ _ _	37-41
Duration of treatment (in days)	_ _ _	42-44
Number of procedures performed by the physician	_ _ _	45-47
Number of diagnoses made by the physician	_ _	48-49
Costs of procedures performed by the physician	_ _ _ _ _	50-54
Missing procedures (number)	_ _	55-56
Costs of missing procedures	_ _ _ _ _	57-61
Total costs of treatment (medical procedures)	_ _ _ _ _	62-66
Costs in out-patient clinic	_ _ _	67-69

END OF CARD 03

Victim's number _ _ _ _
1 2 3 4

Card number _ _
5 6

	CODE	COL.
MAIN CHARACTERISTICS OF THE ACCIDENT		
Type of accident	_ _	7- 8
Severity of accident	_	9
Nature of the accident	_	10
Region of the accident	_ _	11-12
Type of area	_	13
Vehicle occupied by the victim	_	14
Type of vehicle	_ _	15-16
Year of vehicle (model)	_ _	17-18
Speed limit	_ _	19-20
VARIABLES FOR THE TPLS		
Agent's code	_ _ _	21-23
Date of the accident	_ _ _ _ _	24-28
Date of the claim	_ _ _ _ _	29-33
Date of payment	_ _ _ _ _	34-38
Value of H.I. payment	_ _ _ _ _	39-43
Value of Health Ins. payment	_ _ _ _ _	44-48
Medical expenses according to file	_ _ _ _ _	49-53
Medical expenses according to case history	_ _ _ _ _	54-58

END OF CARD 04

HOSPITALIZATION DETAILS

	CODE	COL.
Victim's number	_ _ _ _	1- 4
Card number	_ _	5- 6
Hospitalization number	_	7
Source of information	_	8
Date of admission	_ _ _ _ _ _	9-14
Date of discharge	_ _ _ _ _ _	15-20
Stay in ward	_ _ _	21-23
Stay in semi private ward	_ _ _	24-26
Stay in ordinary ward	_ _ _	27-29
Stay in private ward	_ _ _	30-32
Total stay	_ _ _	33-35
Per Diem	_ _ _	36-38
Hospitalization expenses	_ _ _ _ _	39-43
Other expenses	_ _ _ _ _	44-48
Total expenses	_ _ _ _ _	49-53
Main diagnosis	_ _ _ _	54-57
Institution's code	_ _ _ _ _	58-62
Type of treatment	_	63
Accident code	_ _	64
COMMENTS		

END OF CARD

OUT-PATIENT VICTIM

IDENTIFYING VICTIM's FILE

Victim's number	1 2 3 4
Card number	5 6
Accident number	7 8 9 10
Number of TPLS FILE	11 12 13 14 15 16 17 18 19 20 21
Type of file	22
State of file	23

CHARACTERISTICS OF THE VICTIM

	CODE	COL.
Age	— —	24-25
Date of birth Day	— —	26-27
Month	— —	28-29
Year	— —	30-31
Sex	—	32
Marital status	—	33
Profession	— —	34-35
Category of road user	—	36
Driving experience	— —	37-38
Driver's licence restriction	—	39
Place of residence	— —	40-41
Victim's status	—	42
Injury severity code according to police	—	43
Spaces		44-49

END OF CARD 01

INJURIES

Classification of injuries

Victim's number 1 2 3 4

Card number 5 6

	Information source	CIMA code		Region	Type	System/organ	Severity	Comments
Injury 1 col.	7	8 9 10		11 12	13 14	15	16	
Injury 2 col.	17	18 19 20		21 22	23 24	25	26	
Injury 3 col.	27	28 29 30		31 32	33 34	35	36	
Injury 4 col.	37	38 39 40		41 42	43 44	45	46	
Injury 5 col.	47	48 49 50		51 52	53 54	55	56	
Injury 6 col.	57	58 59 60		61 62	63 64	65	66	
Injury 7 col.	67	68 69 70		71 72	73 74	75	76	

END OF CARD 02

Table 5 summarizes the results of the principal hypothesis.

Table 5 - Victims of Road Accidents: Comparison of Corrected Figures for Department of Social Affairs (Hospital Records) and Department of Transport (Police Reports) Quebec, 1974

Victims	Department of Transport	Department of Social Affairs					
		Errors in type of accidents			No error in type of accidents		
		(1)	(2)	(3)	(1)	(2)	(3)
Killed	1882	1925	1925	1925	1925	1925	1925
Injured	67344	61006	68168	75331	60968	69332	77675
In-Patient	15082	14099	14099	14099	16443	16443	16443
O.P.D.	52262	44937	51798	58660	42655	50658	58660
M.D.'s office		1970	2271	2572	1870	2221	2572
Total victims	69226	62931	70093	77256	62893	71247	79600
Total with correction 1	72035						
correction 2	79388						

(1) 73% participation of in-patients to out-patients department's admissions
(2) 36.5% " " " "
(3) 0% " " " "

The total number of road victims estimated from hospital records lies between 62,893 and 79,600 and most probably between 70,093 and 79,600 (adopting the 36.5% hypothesis as the maximum percentage of in-patients participation to the admission on out-patient department). This range for the number of victims nearly corresponds to the range obtained in corrected figures from the Department of Transport statistics.

INJURIES: NATURE AND SEVERITY

From our records of the QHIB, we tried to identify all the injuries sustained by each victim in the road accidents and then we evaluated the severity of each one, using the Abbreviated Injury Scale developed by the AMA (6). We also computed the Injury Severity Score (I.S.S.) developed by Susan Baker and others (7).

NATURE OF INJURIES - The 1008 victims have suffered 2164 injuries (2.15 injuries per victim). The fractures are the most common injury, accounting for 40.6% of all the injuries; of all the fractures, about one third were open, displaced or comminuted fractures. The second most common injury is contusion (16.4%) followed by lacerations and cuts (16%). Cerebral concussion accounted for 7.5% of all the injuries and sprain for 5.9%. These five types of injuries sum up to 85.6% of all the injuries.

TOTAL INJURY SEVERITY

AIS Region body	Most severe injury	TYPE OF INJURIES (INDICATE SEVERITY CODE)																
		Concussion	Fracture	Laceration Cut Tear	Contusion Abrasion Scratch Bruise	Sprain Dislocation	Pain	Lesion Wound	Luxation	Burns	Bleeding	Wrench Extraction	Rupture	Crushing Breaking	Perforation	Obstruction	Amputation	Other Undefined
(1) General																		
(2) Head/neck																		
(3) Face																		
(4) Chest																		
(5) Abdomen																		
(6) Extremities																		
(9) Undefined																		

SITES OF INJURIES - The extremities are by far the most common regions of injuries with 41.4% of all the injuries; the head and neck is second with 20.9% and the face is about at the same level with 19.8%. Injuries to the chest accounted for 8.5% of all regions and the abdomen is the site of an injury in 5.5% of cases.

SEVERITY OF INJURIES - According to the AIS classification. nearly 73% of the 2,164 injuries reported in our study are minor or moderate; 22% are classified as severe and 5% appear to be life-threatening for the victims (3.7% grade 4 injury and 1.3% grade 5 injury).

TOTAL SEVERITY OF INJURIES - We know that to compute the ISS of a victim we must take the three leading injuries in different areas of the body: 1589 injuries have served for the computation of the ISS for the 1008 victims. The average ISS for in-patients is 10.08 which is more than three times the average ISS of out-patients (3.20).

We already said that one of the advantages of the ISS is the possibility of comparison between victims. It is very interesting to make that comparison by type of road user. In Table 6, we classify road users by ISS and also by the most severe AIS injury.

Table 6 - Injury Severity (ISS & AIS) by Road Users

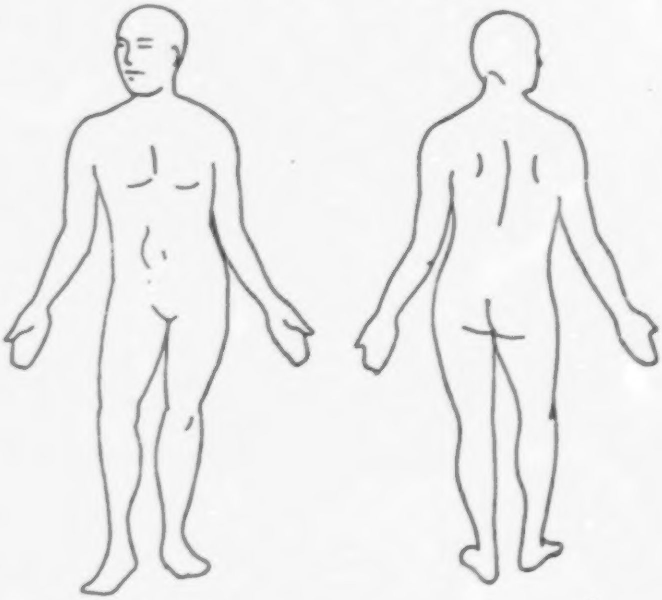
Road User	In-patients		Out-patients	
	ISS	AIS most severe	ISS	AIS most severe
Drivers of cars	10.01	2.64	3.07	1.46
Passengers of cars	9.80	2.60	2.99	1.49
Pedestrians	11.08	2.83	4.41	1.83
Cyclists	9.19	2.52	3.63	1.64
Motorcyclists Drivers	9.42	2.78	3.46	1.71
Motorcyclists Passengers	9.20	2.70	2.46	1.46
Others (snowmobile drivers)*	14.33	3.33	-	-
Total	10.08	2.69	3.20	1.54

*only 6 cases

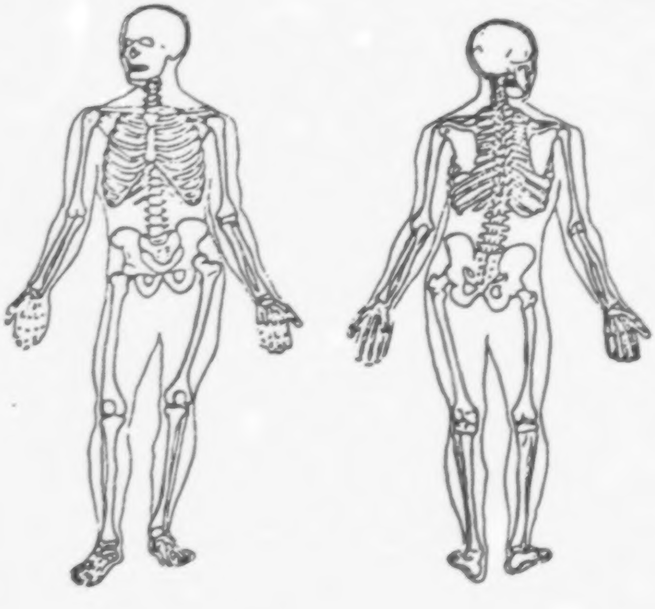
In-patients - According to the ISS classification, pedestrians suffered the most severe injuries in road accidents, followed by occupants of cars (drivers and passengers respectively); then we have the drivers of motorcycles, the passengers of motorcycles and finally the cyclists.

According to the most severe AIS injury, the pedestrians remain in the same position but the motorcyclists (drivers and passengers) rank now in second and third position before cars occupants. To understand this shift by the motorcyclists and also the relative position of each type of road user we must refer to Table 7.

Indicate localization of injuries



Soft tissue injuries



Skeletal injuries

CALCULATING THE INDEX OF TOTAL SEVERITY (ISS)

Victim's number $\overline{1}$ $\overline{2}$ $\overline{3}$ $\overline{4}$

Car number $\overline{5}$ $\overline{6}$

THE THREE MOST INJURED REGIONS

	AID Region	Type of injury	AIS Severity
Injury Region 1	$\overline{7}$	$\overline{8}$ $\overline{9}$	$\overline{10}$
Region 2	$\overline{11}$	$\overline{12}$ $\overline{13}$	$\overline{14}$
Region 3	$\overline{15}$	$\overline{16}$ $\overline{17}$	$\overline{18}$

ISS INDEX: $\sum_{i:1}^{3} (AIS)^2_i$: $\overline{19}$ $\overline{20}$

Number of injuries sustained by victim $\overline{21}$

Number of body regions injured $\overline{22}$

	CODE	COL.
OUT-PATIENT CLINIC		
Treatment in out-patient clinic	—	23
Number of visits	— —	24-25
Type of treatment	—	26
PHYSICIAN'S OFFICE		
Treatment at physician's office	—	27
Number of visits	— —	28-29
Type of treatment	—	30
OPERATIONS		
Number of operations	—	31

LIST OF OPERATIONS

CODE (classification of operations)	CODE (QHIB)
______________	________
______________	________
______________	________
______________	________
______________	________
______________	________

TREATMENT SUMMARY

	CODE	COL.
Date of the first procedure	— — — — — —	32-36
Date of the last procedure	— — — — — —	37-41
Duration of treatment (in days)	— — —	42-44
Number of procedures performed by the physician	— — —	45-47
Number of diagnoses made by the physician	— —	48-49
Costs of procedures performed by the physician	— — — — —	50-54
Missing procedures (number)	— —	55-56
Costs of missing procedures	— — — — —	57-61
Total costs of treatment (medical procedures)	— — — — —	62-66
Costs in out-patient clinic	— — —	67-69

END OF CARD 03

Victim's number $\overline{1}\ \overline{2}\ \overline{3}\ \overline{4}$

Card number $\overline{5}\ \overline{6}$

	CODE	COL.
MAIN CHARACTERISTICS OF THE ACCIDENT		
Type of accident	__ __	7- 8
Severity of accident	__	9
Nature of the accident	__	10
Region of the accident	__ __	11-12
Type of area	__	13
Vehicle occupied by the victim	__	14
Type of vehicle	__ __	15-16
Year of vehicle (model)	__ __	17-18
Speed limit	__ __	19-20
VARIABLES FOR THE TPLS		
Agent's code	__ __ __	21-23
Date of the accident	__ __ __ __ __	24-28
Date of the claim	__ __ __ __ __	29-33
Date of payment	__ __ __ __ __	34-38
Value of H.I. payment	__ __ __ __ __	39-43
Value of Health Ins. payment	__ __ __ __ __	44-48
Medical expenses according to file	__ __ __ __ __	49-53
Medical expenses according to. case history	__ __ __ __ __	54-58

END OF CARD 04

APPENDIX VI

Article presented at the A.A.A.M. Convention

(1) "Road Injuries in Quebec (1974): Nature, Severity and Direct Costs", article presented at the A.A.A.M. Conference, Vancouver, 1977

(2) "Road Crashes and Injuries in Quebec (1974): Patterns among Many Variables" in Accident Analysis and Prevention, vol. 13, no. 4

ROAD INJURIES IN QUEBEC (1974): NATURE, SEVERITY AND DIRECT COSTS

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ABSTRACT

We have analysed a sample of 1008 persons injured in road accidents in the Province of Quebec in the year 1974 in order to explore the accuracy of road accident statistics and to obtain a classification of victims by severity of injuries. We have compared police and hospital reports for our victims, all these informations being gathered in the records of the Third Party Liability Service of the Quebec Health Insurance Board. All fatal cases were notified by police but only 7 of the 22 deaths were correctly notified. For the in-patients, 72.6% were correctly notified and 3.4% were not reported by the police. Only 53.5% of the out-patients were properly notified and 24.4% were not reported by the police.

Using these results, we produced corrected figures for provincial transport statistics which appeared to underestimate the number of victims by 22%. From the data obtained from the Department of Social Affairs, we have estimated that the number of road victims lies between 70,093 and 79,600.

We then computed the Injury Severity Score (I.S.S.) of each victim and found that in-patients were more than three times more injured than out-patients. Pedestrians appeared to be the type of road user with the greatest ISS; occupants of cars ranked second followed by the motorcyclists and the cyclists. Fractures were the most common injury and the extremities were the region most frequently injured.

A strong positive relation was found between the ISS and the period of treatment and the length of stay in hospital confirming the relevance of the ISS for summarizing injury severity, especially in patients with multiple trauma. Finally costs of medical services were estimated for our average in-patient and out-patient.

USING A SAMPLE OF 1008 PERSONS who received medical services (as in-patients or out-patients) as a consequence of a road accident occurring in the Province of Quebec in the year 1974, we tried to elucidate some problems related to the phenomenon of road accident:

(1) the quality of road accident statistics

(2) the classification of persons injured in road accidents (nature and severity of injuries)

(3) the medical services consumption and their costs per victim.

SOURCES OF DATA

The data were obtained from the Third-Party Liability Service of the Quebec Health Insurance Board who links for each victim different records as follows:

(1) the police report (information on the circumstances of the accident, drivers, vehicles and victims)

(2) a questionnaire sent by the Service and filled out by the victim or his family (additional information on the circumstances of the accident and on medical treatment)

(3) the hospitalization report (length of stay, diagnosis, type of treatment, costs)

(4) an historical record of all the medical services provided by a medical specialist or a physician to an in-patient or an out-patient after the accident (medical procedure, date, diagnosis and costs).

With these data, it was possible to follow each patient's progress from the accident to the end of his treatment for most cases.

DESCRIPTION OF SAMPLE

From all the 1974 Third Party Liability Service (TPLS) victim records, we took a sample of 1008 victims. Those victims are issued from 957 different accidents where a total of 1957 persons were injured. We see that some victims are excluded of our sample because the TPLS does not expect claims for these victims. For example, deaths on site of accident are excluded because they do not receive medical services; also excluded are the victims who are considered responsible of the accident (drivers in most cases).

STATUS OF VICTIMS - Of the 1008 victims. 700 were hospitalized and 308 were treated as out-patients (Table 1 and 2). Our sample contains 22 deaths and 17 of them follow the hospitalization of the victim. This proportion (17/700 = 2.4%)

Table 1 - Hospitalized Victims

Status	Number	%
Hospitalization (-24 hours)	15	2.1
Hospitalization (+24 hours)	668	95.4
Death (-24 hours)	8	1.1
Death (+24 hours)	9	1.3
	700	100.0

Table 2 - Non Hospitalized Victims

Status	Number	%
Emergency/out-patient department only	197	64.0
Physician's office only	13	4.2
Emergency/out-patient department and physician's office	93	30.2
Death (-24 hours)	5	1.6
	308	100.0

closely corresponds to the proportion of all the deaths occurring after the hospitalization for the Quebec in 1974 (377/16443 = 2.3%).

AGE AND SEX - Among all the victims, we have 620 (61.5%) men and 388 (38.5%) women (provincial statistics give 62.1% for the men and 37.9% for the women). The mean age of our victims is 30 years which is 1.6 years higher than the mean age of all the victims in Quebec (28.4 years).

TYPES OF ROAD USERS - Of all the patients, 60.2% are occupants of cars (25.6% are drivers and 35.6% are passengers), 18.8% are pedestrians, cyclists and motorcyclists account for 19.5%. Compared with provincial statistics, the drivers of cars are under-represented in our sample and it is because of the source of data; being often considered responsible of the accident, drivers couldn't have a record at the TPLS in the same proportion as other types of road users.

ROAD ACCIDENT STATISTICS: COMPARISON OF POLICE AND HOSPITAL RECORDS

Bull and Roberts (1) in England and Sande and Thorson (2) in Sweden have shown that official road accident statistics may seriously underestimate the real numbers. Our study led us to assess the quality of road accident statistics in the province of Quebec by comparing the data issued from the hospital records and those published by the Department of Transportation of Quebec.

LEVEL AND QUALITY OF VICTIMS' REGISTRATION - Of the 1008 victims in the study, 911 (90.4%) were notified by the police and 97 (9.6%) were not notified. However, the level of registration is very different for in-patients and out-patients (Table 3).

The 22 persons who deceased after the accident were all notified by the police but only 7 were reported as such. We must precise that none of these died on the site of accident; death occurred at least after the arrival of the victims at an emergency department; 9 of the deaths occurred more than 24 hours after the accident. So our data on the deaths cannot serve for assessing the quality of registration for this category of victims.

For the 683 who survived the accident and were hospitalized, 496 (72.6%) were properly reported, 129 (18.9%) were incorrectly reported and 23 (3.4%) were not reported by the

Table 3 - Comparison of Classification of Severity from Police and Hospital Records

Victims	Classified from hospital as			
	Killed	In-patient	Out-patient	Total
Notified by police as				
Killed	7	0	0	7
In-patient	15	496	42	553
Out-patient	0	128	162	290
No treatment	0	1	6	7
Not stated	0	35	19	54
Not notified by police	0	23	74	97
Total	22	683	303	1 008

police. 10 of the 23 victims not reported appeared to be hospitalized more than 6 hours after the accident and 20 of the 23 had injuries which rate less than 9 on the ISS classification.

For the out-patients, only 162 of the 303 victims (53.5%) were notified as such; 42 (13.9%) were notified by the police as in-patients, 6 (2.0%) were classified without injury, 74 (24.4%) were not reported and in 19 cases the police didn't assess the severity of the injuries. We must add that 19 of 74 victims not reported by the police sought medical care later than 24 hours following the accident. Also, injuries of 51 of these 74 victims had a severity of less than 3 on the ISS classification and 72 of the 74 victims less than 9.

CORRECTIONS SUGGESTED FOR PROVINCIAL STATISTICS - Let us look at some possible correction factors derived from our study and from other sources in order to estimate how many persons were injured (fatal and non-fatal injury) in road traffic accidents in the Province of Quebec for the year 1974. For this purpose, we adjusted independantly two types of data: Department of Transport data (police reports) and Department of Social Affairs data (hospital records).

1974 Quebec Department of Transport Statistics - Quebec Department of Transport publishes statistics on the number of victims in road traffic accidents on the basis of the police reports. Thus, in 1974, they reported that 1882 persons were killed and 54,079 were injured in road traffic accidents (3). We also obtained special data on the distribution of these victims by the police injury severity code: killed, in-patient, out-patient and no treatment.

Using some of the results of our study concerning the underestimation of the victims by the police, we produced corrected figures for the transport statistics. For in-patients, 3.4% were found to be not notified and for out-patients, this percentage rises to 24.4. The 4072 victims classified as "no treatment" or "treatment not stated" were distributed in the two categories of in-patients and out-patients according to their proportion in the sample.

We also made two other corrections; the first one accounts for the under-registration of types of victims who were not included in our sample because of the sources of data: these are the victims of accidents where only one motor vehicle is involved and where only the driver is injured. We used the results found in the study of Bull and Roberts (4) for the region of Birmingham in England: 3.9% of all the victims were of that kind and not reported.

The second correction accounts for the pedal cyclists who were injured when no motor vehicle is involved. That kind of accident does not correspond to the definition of road accident that has to be notified by the police but in view of comparison with hospital statistics we had to make this correction because we have some reasons to believe that a proportion of these accidents are classified as road accidents in hospital records and cannot enter in Transport Statistics. Table 4 gives the original and corrected figures for the 1974 Quebec victims.

Table 4 - Victims of Road Accidents: Original and Corrected Figures for Quebec Department of Transport, 1974.

Victims	Original numbers	Corrected numbers
Killed	1882	1882
Injured	54079	67344
In-patient	13942	15082
Out-patient	36065	52262
Without treatment and not stated	4072	-
Total victims	55961	69226
Total with:		
1) correction for victims not included in the sample (3.9%)		72035
2) correction for (1) + pedal cyclists alone (12.8%)		79388

As a conclusion to this section, we could say that transportation statistics underestimate the numbers of victims by about 22% (comparing 72035 to 55961).

Department of Social Affairs (hospital records) - Department of Social Affairs (D.S.A.) made special studies on the number of admissions in hospital and in emergency or out-patient department which are attributed to road victims (5). In order to compare their data with the transportation statistics, we must convert the admissions in terms of persons who received treatment following a road accident.

First, for the persons killed, Department of Social Affairs takes their number from the Vital Statistics who reported 1925 deaths from motor vehicle traffic accidents. Then, the total number of admissions to an hospital for road victims is evaluated to 20,931 in 1974; we also know that 377 of these admissions ended by the death of the patient. We have to be careful about those statistics because the total of 20,931 includes readmittances and because we have some restrictions concerning the registration of the victims in hospital records; in fact, in 1973, we found that 14% of all the hospitalizations pertaining to road victims showed a diagnosis (ICDA code) which dit not correspond to an immediate or delayed consequence of injuries suffered in a road accident. It is also possible that the accident type was wrong and that they attributed to road traffic accidents victims that were not road victims.

The first corrections account for these factors: if all the errors are in the diagnosis (ICDA code), no correction to the number of admissions has to be done; if all the errors refer to accident type, we must lower the admissions by 14%. So, the number of admissions lies between 18,001 and 20,931. Now we substract the deaths occurring after the hospitalization before correcting the data for the readmittance.

The readmittance rate is evaluated to 25% by D.S.A. and this is also what we found in our study if we standardize our distribution of victims by types of road user. With this second correction, the number of in-patients for 1974 lies between 14,099 and 16,443.

We now have to evaluate the number of out-patients, using the number of admissions in emergency and in out-patient department. In 1974, the D.S.A. reports 167,181 of these sorts of admissions; these admissions belong in part to in-patients who have to come back to the out-patient department following their stay in hospital: in our study, we find that 73% of the in-patient came back in the out-patient department with an average number of 3.8 visits. The total admissions belong also to out-patients who, according to our study, made 2.85 visits to out-patient department. On the basis of these informations, we evaluate the number of out-patients between 42,655 and 44,937.

However, we have to make some hypothesis concerning the percentage of in-patients visits to out-patients department that are really considered as an admission to out-patient department. If this percentage equals 0, then the out-patients are evaluated to 58,660 (extreme hypothesis).

To the total of persons treated in out-patient department, we must add the number of persons treated only at the physician's office. In our study, this kind of injured persons was found to be 4.2% of the total of out-patients.

Table 7 - **Number of Injuries, Number of Regions, ISS, Most severe** AIS by Site, by Type of Road User (In-patients)

Road User	Mean number of injuries	Mean number of sites	ISS mean	Mean AIS extremities	Mean AIS head & neck
Drivers of cars	2.42	1.75	10.01	2.69	2.37
Passengers of cars	2.41	1.77	9.80	2.58	2.53
Pedestrians	2.23	1.63	11.08	2.77	2.90
Cyclists	2.59	1.83	9.19	2.76	2.33
Motorcyclists drivers	2.40	1.46	9.42	2.83	2.33
Motorcyclists passengers	2.20	1.55	9.20	2.73	2.50
Others (snowmobile drivers)*	3.00	1.33	14.33	3.00	3.00
Total	2.38	1.69	10.08	2.72	2.55

*Only 6 cases

This table shows the relation between the number of injuries, the number of regions injured and their results in terms of I.S.S.. It also gives the mean AIS score for some specific regions (extremities, head and neck).

The differences between the categories of road users are not enough large to lead to any clear conclusion. However, we can see that motorcyclists suffered more severe injuries in the region of the extremities than in the region of the head and neck (the use of helmets is mandatory in Quebec).

Also, comparing to the other road users, their injuries appears to be located in a lower number of regions; this fact may affect their score in the ISS classification as shown in table 6.

ASSESSMENT OF THE ISS AS INDICATOR OF INJURY SEVERITY - The in-patients and out-patients ISS having different period of treatment are summarized in Table 8. There is a generally positive relationship of treatment period with mean ISS for the two categories of victims. We must add that the mean ISS includesthe ISS of the 22 victims who died; this inclusion tends to increase the mean ISS, particularly those for whom treatment period is only one day.

The same type of relation was outlined between the ISS and the length of stay in hospital (X^2 was significant at 1% level). Those results confirm the relevance of the ISS for summarizing injury severity, especially in patients with multiple trauma.

CONSEQUENCES OF ROAD INJURIES: HOSPITAL AND MEDICAL SERVICES CONSUMPTION

Table 9 summarizes the principal consequences of road injuries in terms of medical and hospital services consumption.

Table 8 - Mean ISS in Relation to Treatment Period of In-patients and Out-patients

Treatment period	In-patients		Out-patients	
	Mean ISS	St. dev.	Mean ISS	St. dev.
1 day	18.30	15.48	3.23	3.27
2-7 days	6.01	5.18	2.44	1.74
8-14 days	9.90	6.88	2.51	3.18
2-8 weeks	8.34	5.82	3.17	1.80
8-26 weeks	10.43	6.33	4.07	3.02
26-52 weeks	11.42	6.17	4.00	2.79
52 + weeks	13.04	6.99	5.00	5.36
Total	10.08	6.81	3.20	2.80

The average in-patient of our sample, who is 29.7 years old, is hospitalized 1.34 times for a total stay in hospital of 22.16 days and a cost of $2008; he also visits out-patient department 2.83 times for a cost of $30. He goes 1.85 times to the physician's office and causes a total number of 21.8 medical procedures which cost is $340. The treatment period of an in-patient is 159 days.

The average out-patient, aged 30.6 years, makes 2.76 visits to out-patient department for a cost of $32; he also consults physician at his office 1.94 times. During his period of treatment which lasts 50 days, 9.17 medical procedures are done for a total cost of $85.

So, the in-patient generates costs of $2,379 in hospital and medical services and the out-patient only $117. The costs found in this series of patients must be interpreted with caution; in fact, because of the source of data, our costs for the average victim will not necessarily parallel those of all the victims in road accidents. However, by type of road user, costs are more representative of all victims of his type.

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Table 9 - Hospital and Medical Services Consumption by Type of Road Users

Road Users	Age	Hospitalizations			Out-patient department		Visits to Physician's Office	Period of Treatment (days)	Medical Procedure	
		Number	Length of stay (days)	Costs	Number of Visits	Costs			Number	Costs
In-patients										
Drivers of cars	35.62	1.27	16.18	1519.48	2.81	34.32	2.03	155.08	20.77	335.70
Passengers of cars	31.23	1.26	19.83	1787.80	2.38	25.73	1.58	130.77	19.31	289.07
Pedestrians	30.73	1.40	31.31	2795.30	2.49	25.02	2.27	152.45	28.32	343.17
Cyclists	17.48	1.19	17.74	1434.95	2.40	27.17	0.74	150.67	13.81	215.33
Drivers of motorcycle	21.08	1.61	22.54	2159.76	4.74	44.16	2.54	253.90	24.34	567.39
Passengers of motorcycles	17.30	1.60	28.25	2449.35	4.35	42.75	0.10	215.65	21.52	282.10
Others*	24.67	1.17	33.50	3172.17	2.83	26.50	0.33	158.50	19.33	429.67
Total	26.69	1.34	22.16	$2008.48	2.83	30.23	1.85	159.25	21.82	340.55
Out-patients										
Drivers of cars	35.65				2.48	31.87	3.87	56.82	14.15	110.27
Passengers of cars	32.16				2.94	32.27	0.91	44.55	6.97	75.06
Pedestrians	29.05				3.14	33.52	1.83	55.93	7.96	83.28
Cyclists	14.05				3.18	34.55	2.73	117.91	12.27	120.09
Drivers of motorcycle	20.71				2.31	28.10	0.59	28.21	4.34	52.17
Passengers of motorcycles	19.43				2.79	31.71	0.50	25.79	4.72	48.86
Total	30.66				2.76	31.93	1.94	50.09	9.17	85.19
Total	29.99				2.81	$30.75	1.88	125.90	17.95	$262.52

*Only 6 cases

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ROAD CRASHES AND INJURIES IN QUEBEC (1974): PATTERNS AMONG MANY VARIABLES†

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Abstract—Data on 1008 Quebec road victims obtained from linkage of governmental records have led to different types of analyses. This article presents an application of correspondence analysis to these data. We have chosen one example with its specific results showing expected associations between variables and new, unexpected associations which are plausible. The resulting patterns indicate a clear distinction between hospitalized and non-hospitalized victims and between a rural and an urban type of road crash. This multidimensional approach gives an overall picture of the patterns among the variables studied, indicating which subsets of variables might be investigated further.

1. INTRODUCTION

Data related to road crashes are continuously gathered by many governmental agencies (Ministry of Transport, Health Insurance Board, Ministry of Health, etc.) independently from one another. However, if it is possible to link medical and police report information, there can be a better assessment of crash severity through injury severity measures (AIS and ISS), a better understanding of the crash process through time and indications of practical analysis refinements that could be developed for regular monitoring of car crashes.

A group from University of Montreal has undertaken a pilot research study oriented toward injury analysis using linkage of governmental and paragovernmental records. In previous articles [Bourbeau and Laberge-Nadeau, 1977; Laberge-Nadeau, *et al.* 1978] various types of analyses were carried out in order to (1) assess the quality of governmental statistics about road crashes (2) determine the nature and severity of injuries, using the AIS and ISS classifications (3) measure direct costs of medical services per victim whether given in hospital, OPD or private office. This article focusses on the possible relationships between accident variables and injuries. Correspondence analysis, a multivariate statistical method [Benzécri, 1973], is used to describe and interpret the overall structure of the data.

Several authors [Mackay, 1968; Haddon and Baker, 1976; Benner, 1978] have already suggested that a pertinent approach (model) for studying causes and consequences of road crashes would be through a multidimensional perception of the process. This is in accordance with the fact that there is not a single factor responsible for an "injury event"; many variables interact (variables related to the road user, the road conditions and the environment) to produce road crashes. Correspondence analysis has the advantage that it allows for passing a multidimensional judgement and thus corresponds to the very nature of a road crash.

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2. DATA AND STATISTICAL METHODOLOGY

Data

The observations come from a sample of 1008 persons who received medical services as a consequence of a road crash which had happened during 1974 in the Province of Quebec. The data were obtained by linking the following records: (i) the accident report completed by the police (Department of Transport), (ii) the hospitalization report (Department of Social Affairs), (iii) the case history of all medical services obtained by the victim, (Health Insurance Board), and (iv) a questionnaire completed by the victim or his family (Third Party Liability Service of the Health Insurance Board). Each victim could be characterized by very many variables which may be classified into three groups: Demographic variables (age, sex, civil status), variables related to medical services received (diagnosis, surgical procedure and other medical treatment, length of hospital stay, length of treatment, treatment costs), and variables related to accident circumstances (environment, roads, vehicle, driver). Thus we were faced with a large number of variables (more than 100 were available) compared with the sample size. The examination of simple frequencies and two-way tables indicated some dominant characteristics but did not allow for an overall picture to emerge. Details of the sampling procedure and basic descriptive statistics are reported by Bourbeau *et al.* [1977] and by Laberge-Nadeau *et al.* [1978]. Obviously, many of the variables are related but the structure of the relationship is rather complicated. Hence, we are looking for a way to describe the overall structure of the data without imposing a model *a priori*. In our view, correspondence analysis is the appropriate tool to achieve this goal.

Methodology

Correspondence analysis is well known and frequently used in France. For details about this method, the reader is referred to the literature [Benzécri, 1973; Hill, 1974; Lebart *et al.* 1977]. Here follows a brief description: Traces of correspondence analysis, although not under this name, can be found in the 1930s in the research work of Fisher, Hirschfeld and Hotelling [see Hill, 1974], but it only emerged as a distinct method of multidimensional statistical data analysis in the early 1960s under Benzécri in France who called it "Analyse factorielle des correspondances".

It is a method of factor analysis (just like principal component analysis) which is particularly suited for qualitative data. Let us think of the data as a two-way table where a row contains the observations for a subject (in our case a crash victim) and where a column contains the values of a given variable for all the subjects. Correspondence analysis finds the best subspace (in the sense of minimum distance) to represent the subjects, or equivalently, the best subspace to represent the variables, where the chi-square distance is used to measure the proximities between points. Projections of the data onto the principal factor planes may then be used to visualize and interpret the relations among the subjects and the variables. In the case of different types of variables (qualitative, ordinal, quantitative), it is the practice to code them as dichotomous categories. For example the variable sex will be represented as the three categories: male, female and unknown. Each subject takes the value one in the category of its sex and zero for the other ones (male: 1, 0, 0; female: 0, 1, 0; unknown: 0, 0, 1). The large number of categories which commonly arises in applications leads naturally to relatively small percentages of the total variation explained by any one factor[†]. Nevertheless, valid interpretations of the data can be made [see Lebart *et al.*, 1977, section VI. 3].

To help readers who are unfamiliar with correspondence analysis to follow the reasoning which led to our interpretation of the results presented in Fig. 1, the general rules of how to analyse and interpret such graphic are summarized in the following paragraphs.

As a first step one examines the overall picture: two distinct sets of points are contained in the principal plane defined by the first two axes, one set represents the individuals, the other one the variables. Such sets often form clusters, triangles or they are crescent shaped; they have varying densities in different parts of the plane.

Clusters of individuals indicate subgroups with common attributes, clusters of variables

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[†] This is in contrast to principal component analysis where a few factors should add up to a substantial percentage of the total variation explained to make possible a reasonable interpretation of the data.

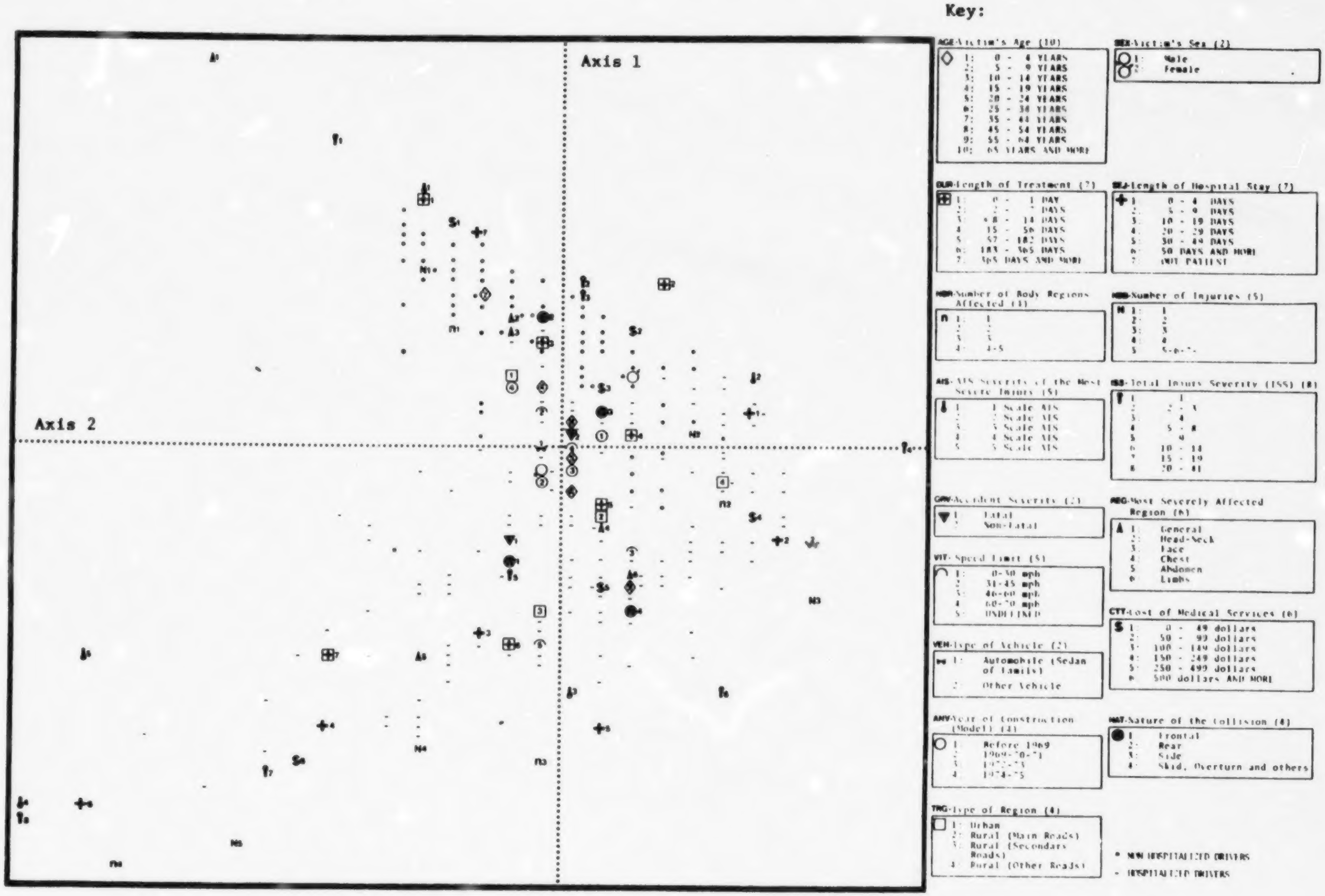

Fig. 1. Correspondence analysis: simultaneous representation of the principal factor planes for the variables and the drivers.

indicate attributes which occur frequently together. Points representing individuals which lie close together show that these individuals possess similar profiles, that is they have the same attributes in common. Points representing variables which lie close together show that these variables or attributes occur often simultaneously for many individuals.

It is important to note that the closeness of one individual to one variable cannot be legitimately interpreted. However, the position of one individual with respect to the set of the variables shows that this individual is characterised mainly by the variables represented in its neighbourhood. Similarly, the position of a variable with respect to the set of individuals shows that this variable is a very common attribute of the individuals in its neighbourhood.

These relationships, the gradation along the axes, the variables and groups of individuals represented at opposite ends of the axes make it possible to interpret and to name them. The crescent shape of a set of points is quite typical in applications (also present in Fig. 1). This usually means that there is similar gradation of the variables and the individuals along both axes with the second one providing a differentiation of the extreme cases. Furthermore, the density of the points gives an indication of the variability, a high density means less variation than a low density.

Finally, a word of caution: since these representations are projections, it may happen that two points are represented closely together in the plane even though they are rather distant from each other in the original high dimensional space. Other aspects of the method furnish the additional information needed to prevent wrong interpretations.

Our sample contained different categories of road users such as drivers, passengers, pedestrians, cyclists, etc. Various groups and combinations of groups have been analysed [Laberge-Nadeau *et al.*, 1978]. These analyses led to the elimination of certain variables which did not contribute additional information, the analysis presented here was carried out on 258 drivers and 16 variables yielding 78 categories (see Fig. 1).

3. RESULTS

The first two factors account for 13% of the total variation (8 and 5% for the first and second factor respectively) which is acceptable given the variables and their coding.

The first factor reflects the general severity level of a crash. In the plane representing the variables (Fig. 1), the severity indices of the injuries (AIS, ISS, NBB and NBR), the length of hospital stay and treatment, the treatment cost and the accident variables associated with serious crashes (frontal collision, rural roads, high speed) are all ordered along the first axis in increasing severity towards the bottom of the page. In the representation of the individuals, superimposed on the one of the variables (Fig. 1), one finds the hospitalized drivers mainly in the lower part of the plane, the out patient victims mainly in the upper part. In addition, the density of points is higher in the area of the images of the out patient victims compared with the hospitalized ones, and there are only a few points near the center of the plane. This means that there is less variation among the out patient victims than among the hospitalized ones. Furthermore, the variables represented near the center in Fig. 1 do not discriminate between these two types of victims, they are associated with both of them.

The first factor gives thus the intensity of the variables, the second factor is a function of the first (Guttman effect) separating the extreme cases from the average ones. In the following paragraphs the results concerning the three groups of variables and the relations between them are discussed in detail.

Variables related to injuries

The order of the different severity indices is accurately repeated. The categories of the ISS score (ISS 1 to ISS 8 in increasing order of severity) and of the AIS score are placed in order along the first axis†. The same is true for the number of injuries sustained (NBB), the number of body regions injured (NBR), the length of hospital stay (SEJ), the total length of medical treatments (DUR) and the treatment cost (CTT).

As for the part of the body injured, this has a special meaning for a driver, given his position in a motor vehicle. The most severely injured regions are the abdomen (REG 5), limbs (REG 6) and the chest (REG 4) whereas the general body regions head or neck and face (REG 1, REG 2, REG 3) are associated with less serious injuries.

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†It must be remembered that this profile of the injury severity according to the body region does not concern victims who die on accident sites, not included in our sample.

Variables related to crash circumstances

The nature of the collision seems important in determining the crash severity: Frontal collision (NAT 1), skids and overturning (NAT 4) are associated with more severe accidents whereas rear collisions (NAT 2) and side collisions (NAT 3) occur frequently in minor crashes.

The authorized speed limit is not very discriminant except when it is between 50 and 60 miles per hour (VIT 4). This variable is confounded with the variable describing the region where the accident occured; thus the urban region (TRG 1) is associated with minor crashes whereas the rural region (TRG 3: mainly secondary roads with speed limits from 50 to 60 mph) is associated with serious crashes.

The variables giving the type of motor vehicle (VEH) and year of construction (ANV) are represented close to the center, they do not seem to discriminate between types of crashes.

Demographic variables

The variable "age" is often mentioned as an important variable in relation to the severity of injuries sustained in an accident. The age group 55–64 yr (AGE 9) is related to the indices of the more severe injuries: older victims are more seriously injured and need longer lasting medical care. On the other hand, the age group 35–44 yr (AGE 7) is associated with minor injuries and accidents in urban areas. The other age groups are less discriminant with respect to accident severity.

The points representing the two sexes are close to the center, on the average the women seem to be slightly less severely injured.

Types of accidents

The pattern of injuries found in our study is in accordance with the concept of "the three level injury of the driver" advanced by Weisz *et al.* [1974]. By virtue of his position inside the vehicle, the driver of an automobile is exposed to injuries in three regions: Head/neck and face, limbs and chest/abdomen. It seems that the more severe the accident (frontal rather than rear or side collision), the more parts of the body are affected. A simple rear or side collision in an urban setting would possibly produce an injury to the head/neck region (lacerations to the head, cervical sprain) or face (lacerations or contusions to the face caused by contact with the windshield); a frontal collision or a skid in a rural area would, in addition, produce injuries at the 1st level (head/neck and face), injuries to limbs (sprains, fractures) and possibly injuries to the chest region (rib fractures, haemothorax) and abdomen (rupture of the spleen, intestinal performation caused by contact with the steering wheel or the dashboard).

Thus, the following two accident patterns seem to emerge:

Urban type: Urban area
Rear collision
Speed limit below 30 mph
Victim aged 35–44 yr
Minor injuries to the head/neck and face
Out patient victim

Rural type: Rural area-secondary roads
Frontal collision, skid or overturning
Speed limit 50–60 mph
Victim aged 55–64 yr
Severe injuries to limbs, abdomen or chest
Victim hospitalized

Another analysis involving pedestrians (189 victims, 27 variables, 115 categories) also led to a clear distinction between two types of accidents similar to the ones described above.

In the urban type of accident the environmental conditions (in the general sense) are rather favourable and the accident seems linked to the density of the vehicle and pedestrian traffic as well as to special characteristics of the injured pedestrians (inexperienced children, lack of mobility, or poor vision in old people) or of the drivers involved (lack of experience, women, and poor vision or visibility). The rural type of accident occurs more often in rather unfavourable environmental conditions associated with certain characteristics of the drivers (youth, inexperience and speed). These patterns confirm what other studies had shown [Berger, 1974; Knoblauch, 1977].

4. CONCLUSION

Correspondence analysis appears to be a useful statistical tool to study road crashes [see also Biecheler and Marchal, 1969].

A road accident is the result of the simultaneous interaction of many variables [Koornstra, 1969] where the particular action of a given variable is difficult to appreciate. Severity of the injuries sustained in a road crash depends also on a number of variables. Several authors do share the opinion that the human factor (behaviour and attitudes) plays a predominant role as compared with factors dependent on the environment or the vehicle [Joscelyn and Treat, 1973].

In research on contributory factors to a road crash, the results obtained are always dependent to some degree upon the data sources available and the investigator choice of variables. In our research the data obtained on the injuries were particularly valuable since they allowed a precise description and severity classification of the injuries. It is noteworthy that large amounts of data were available at modest costs, already collected for administrative purposes and not for research (governmental centralized secondary data).

Some variables on the driver, the environment and the vehicle were also available and could be linked with the injury data. However the data in the latter field was not complete: there was no or little information on alcohol, stress, use of safety belt, driver's actions, actual speed. Consequently the patterns which emerged from our present analysis reflect a situation as presented by the available variables.

Nevertheless, the coherence of the results is remarkable. In fact one of the interesting results concerns different indices that measure the severity of the injuries in various ways: duration of medical treatments, length of hospital stay, treatment costs, number of injuries per person, number of injured body regions, AIS (Abbreviated Injury Scale), ISS (Injury Severity Score). Although the data codification ignored the order of the categories within variables, they are spread along the first axis in a logical order. This order is not artificially caused by a particular choice of scale for the variables as might happen in an ordinary factor analysis.

However too much information would be lost if one combined these indices into a single one, since they measure different facets of the medical state of the victim.

As to the other variables, describing the accident circumstances, they are more or less attracted by different categories of variables measuring the severity of the injuries. These relations lead to two types of accidents (urban type versus rural type) as documented elsewhere.

For a descriptive epidemiological study of road crashes, correspondence analysis is an appropriate statistical technique. It allows for a multidimensional approach, it gives an overall picture of the patterns among the variables studied, it indicates which subsets of variables should be investigated further.

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APPENDIX VII

- SAMPLING TECHNIQUE
- PROCEDURE FOR DATA COLLECTION

SAMPLING TECHNIQUE

A) Type of sampling

Having made these preliminary choices, we now want to obtain our sampling of 1000 victims of road accidents which occured in 1974.

The only possible difference concerns the state of the file - whether it is active or closed. The files are not regrouped with respect to the nature and date of the accident.

On the other hand, it was practically inconceivable to register all road accident cases for 1974. Some 40,000 Third Party files would have had to be inspected singly and the regular staff mobilized. Therefore, we opted for a cluster sampling.

We assumed, at first, that the road accident victims' files for 1974 were randomly distributed among all the files. The Third Party files are classified in shelves according to their alpha-numerical code (the COMPOS). This code comprises the letter of the victim's name followed by the first three letters of the family name, and the birthdate, and by a code for the victim's sex (1 for male, 2 for female). For example, a female victim born on October 15, 1950, by the name of Reine Ouellette, would be identified by the following COMPOS: ROUE 1510502.

There is every reason to believe that no classification used by the Third Party can influence the distribution of road accident victims for 1974 or the choice of victims (i.e. a certain name of a certain COMPOS may be more likely to reappear among the road accident victims or among our sample).

Having made this remark, we randomly chose (in a randomly numbered table) a certain number of boxes or rows, according to the lay-out of the files, and from the chosen files we looked for all the cases of road accident victims in 1974. It is therefore a case of cluster sampling.

It must be stressed that the number of files to be recorded had to be voluntarily increased. In order to obtain the 1000 files of the final sample 1200 files were registered. In fact, at the time of the pre-test we realized that certain files did not contain all the necessary information for our study (even if it was completed to allow the Third Party to make its claim).

B) Registering 1200 files

The procedure just described was made on two types of files: active and closed. Moreover, the special arrangement of the active files compelled us to distinguish two types of active files. (Classification by row and classification by box).

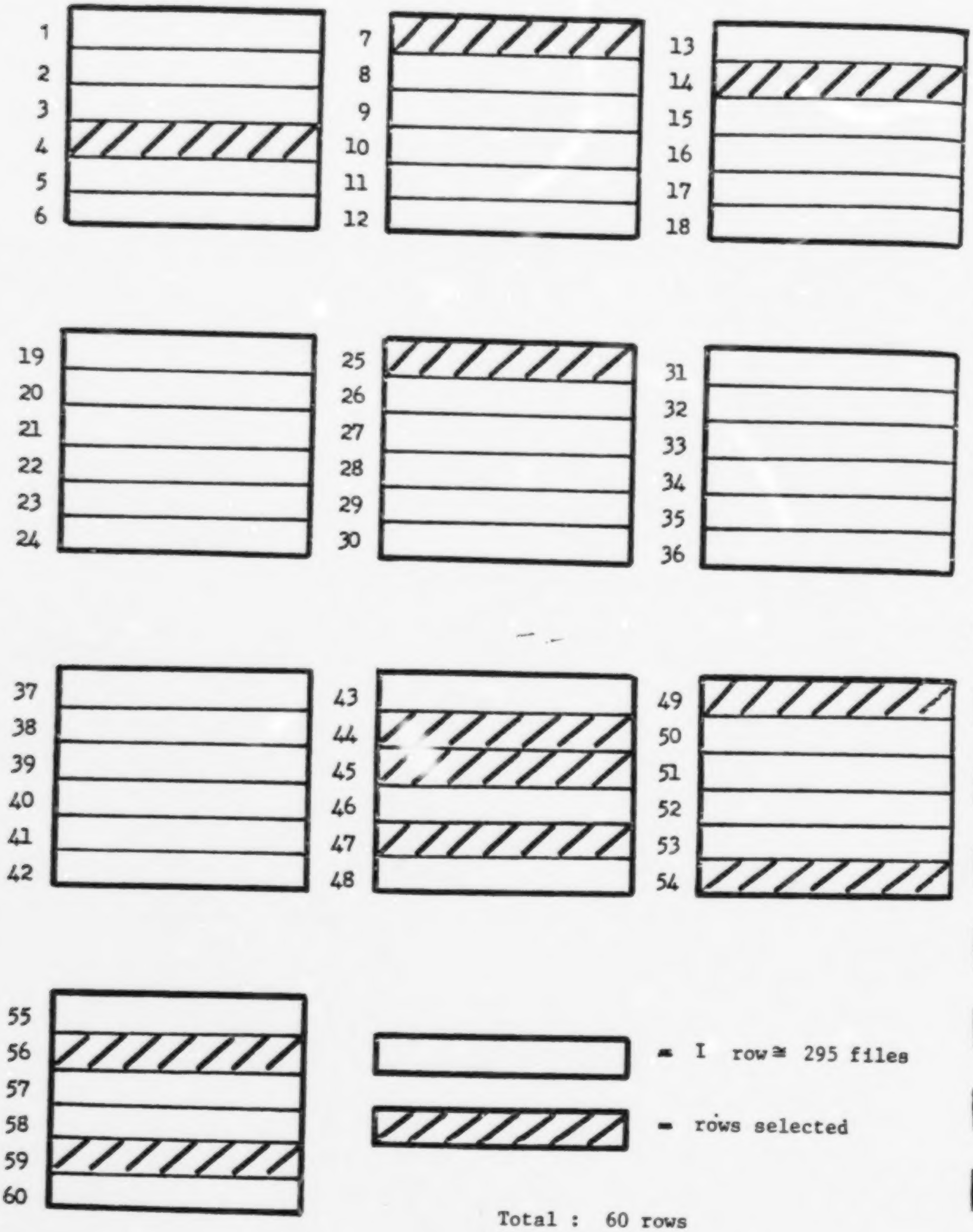
a) The active files (1st type)

This section of the active files is classified in ten shelves of six rows each (fig. 1). Each row contains a similar number of files.

The rows were numbered from 1 to 60 and 11 rows were chosen (18.3%) from which files for 1974 road accident victims were found. In order to determine the fraction of the sampling, we relied on the results of certain tests made before beginning research into the files. The fraction of the sampling was fixed at about 1/6.

The following are the results of our research into the 1974 road accident victims' files.

Figure I : Arrangement of active files (1st type) and selection of rows of sample.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= I row ≅ 295 files

= rows selected

Total : 60 rows
11 rows selected

TABLE I

Distribution of active files (type 1) selected in the sample according to row and class of victim.

Row	Total files	Files of road victims in 1974		
		Hospitalized	Non-hospitalized	Total
4	286	14	7	21
7	261	19	10	29
14	304	29	5	34
25	253	22	5	27
44	301	27	7	34
45	339	25	11	36
47	387	24	14	38
49	299	19	3	22
54	277	23	9	32
56	323	35	9	44
59	315	31	11	42
TOTAL	3245	268 (74.7)	91 (25.3)	359 (100.0)

From the 3,245 files inspected in the eleven (11) chosen rows, 359 victims of a 1974 road accident were identified (in other words 11.06%).

These results make it possible to estimate the total number of active files dealing with a 1974 road accident victim from among these files.

The total number of files is 17,700 (an average of 295 files per row for 60 rows); the total number of files concerning a 1974 road accident victim is 1,958 (11.06% of 17,700).

b) Active files (2nd type)

This section of the active files is classified in a set of 605 boxes arranged on 6 shelves (fig. II). Each box contains a similar number of files. We randomly chose (table of numbers at random) 100 boxes from the 605 (16.5%) (table 2).

At first a total of 278 files were registered but 36 were rejected after verification because they did not refer to a 1974 road accident. Thus, 243 files replied to our criteria - i.e. 10.4%

These results allowed us to estimate the total number of active files of the 2nd type at 14,072 (23.26 files per box for 605 boxes). In the same way, the total number of files in 1974, was estimated at 1,420 (10.45% of 14,072).

In summary, from a grand total of 31,772 active files (type I and II) we inspected and identified 602 road accident victims for 1974. The total of road accident victims for that year, from among the active files was estimated at 3,428.

Our estimate of the total number of active files was compared to the estimate made by the Third Party Liability Service from an administrative list: The TPLS estimated, 30,680 active files at the time of our study.

Figure II: Arrangement of active files (2nd type) and selection of boxes of sample

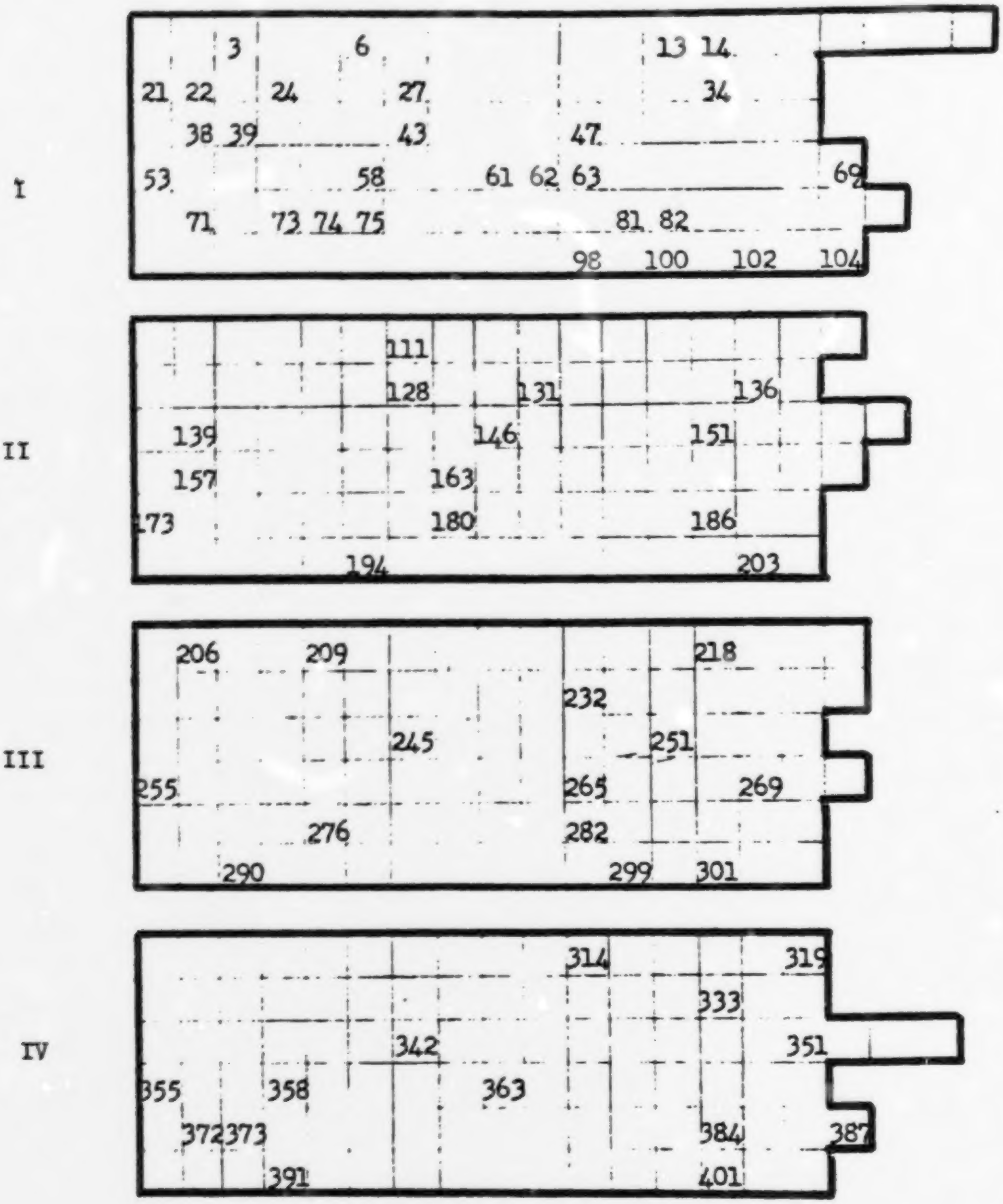
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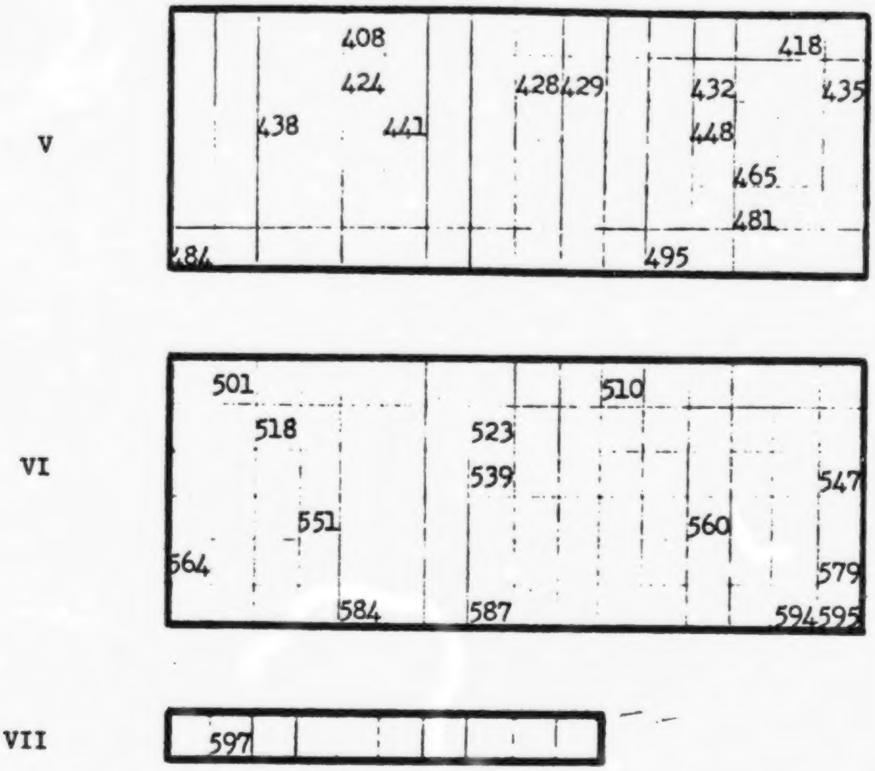
Figure II: (cont'd)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□ = 1 box ≅ 23 files

▣ = selected box

Total: 605 boxes

100 boxes selected

TABLE 2

Distribution of active files (type 2) selected in the sample according to box number.

Box Number	Total Files	1974 files	Box Number	Total Files	1974 files	Box Number	Total Files	1974 Files
3	16	1	146	34	4	387	14	3
6	23	2	151	13	1	391	35	1
13	24	1	157	20	0	401	23	3
14	12	3	163	40	7	408	22	2
21	21	2	173	30	3	418	21	1
22	17	2	180	25	4	424	18	1
24	23	4	186	26	2	428	16	3
27	11	4	194	14	1	429	17	1
34	11	2	203	32	2	432	9	2
38	20	2	206	18	1	435	19	2
39	26	3	209	15	4	438	22	3
43	13	3	218	22	1	441	24	4
47	14	2	232	16	1	448	26	1
53	25	1	245	24	1	465	22	1
58	26	6	251	24	3	481	26	1
61	21	3	255	30	1	484	30	1
62	38	4	265	24	4	495	25	2
63	29	2	269	31	3	501	24	3
69	26	7	276	19	2	510	33	3
71	25	5	282	7	0	518	31	5
73	20	4	290	18	2	523	14	2
74	25	4	299	16	1	539	31	3
75	26	7	301	17	2	547	39	3
81	31	5	314	22	5	551	26	1
82	30	2	319	13	6	560	35	4
98	12	2	333	20	5	564	23	4
100	19	2	342	21	5	579	40	3
102	25	4	351	37	3	584	21	2
104	20	1	355	22	2	587	33	7
111	16	1	358	24	4	594	17	5
128	26	0	363	33	5	595	18	2
131	29	3	372	28	3	597	38	5
136	27	4	373	27	2			
139	23	5	384	22	2			
						TOTAL	2326	279 *

* Following verification, 36 accidents were rejected since they did not happen in 1974. The initial sampling thus includes 234 cases.

We have, therefore, up to now, drawn up a sample of 602 active files. Our objective is to examine about 500 of these files in our final sample. It must be noted that the rejected files do not present any apecial features with respect to the type of accident or the type of victim.

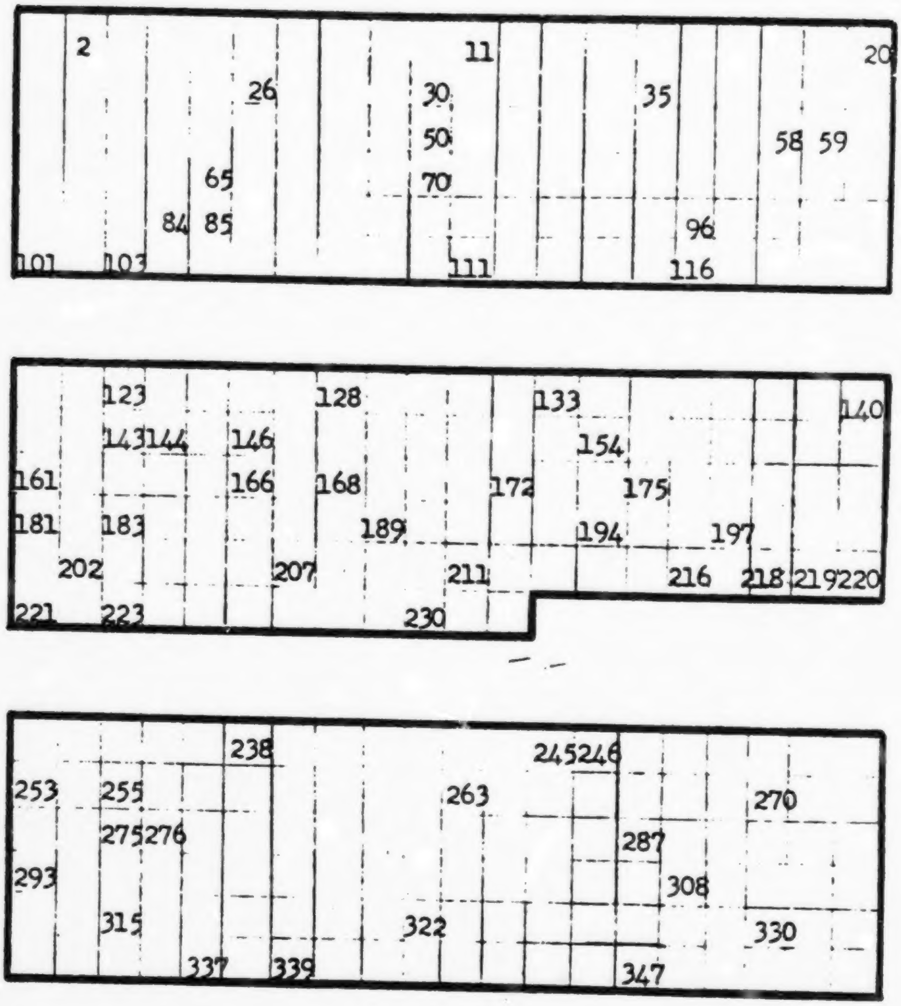
c) Closed files

We adopted the same procedure in order to draw up an initial sample of about 600 road accident victims (1974) from the closed files. A file at the Third Party may be closed for several reasons. At first, when the claim is paid by the Third Party, it may be that the liability is attributed to the victim for whom the TPLS had a file; then, if the third party is not solvent, the file is closed by referral to the Indemnity Fund for road accident victims. Finally, certain files can be closed without claim settlement for other administrative reasons.

The closed files from which our random selection was made, were distributed into a set of 352 boxes containing approximately the same number of files (Fig. III).

We randomly chose (Random Table of Numbers) a total of 64 boxes from among the 352 boxes (18.2%). After reviewing 2,604 files, we found 598 cases of 1974 road accident victims (table 3).

Figure III: Arrangement of closed files and choice of boxes of sample.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347

☐ = I box ≃ 41 files

▣ = selected box

Total : 352 boxes

64 selected boxes

TABLE 3

Distribution of closed files selected in the samples according to box number and type of injury.

		Road accidents in 1974		
		Victims		
Box Number	Total Files	Hospitalized	Non-hospitalized	Total
2	54	1	2	3
11	46	4	4	8
20	50	11	4	15
26	34	7	3	10
30	46	2	4	6
35	40	2	8	10
50	41	4	2	6
58	43	6	2	8
59	38	1	3	4
65	38	3	4	7
70	40	4	4	8
84	43	1	0	1
85	37	3	6	9
96	45	2	2	4
101	45	3	0	3
103	49	6	4	10
111	39	3	5	8
116	48	7	4	11
123	31	6	2	8
128	34	8	2	10
133	23	3	1	4
140	38	11	3	14
143	37	5	2	7
144	45	10	4	14
146	42	11	2	13
154	34	7	4	11
161	37	9	3	12
166	33	10	0	10
168	42	12	4	16
172	34	6	3	9
175	31	8	3	11
181	28	7	1	8

TABLE 3 (cont'd)

Distribution of closed files selected in the samples according to box number and type of injury.

Box Number	Total Files	Road accidents in 1974		
		Victims		
		Hospitalized	Non-hospitalized	Total
183	35	8	4	12
189	25	5	3	8
194	41	11	4	15
197	36	7	4	11
202	41	15	4	19
207	37	10	3	13
211	37	13	1	14
216	40	6	6	12
218	48	6	6	12
219	43	12	7	19
220	43	8	5	13
221	36	9	1	10
223	36	12	5	17
230	37	10	4	14
238	53	2	1	3
245	38	2	5	7
246	34	1	6	7
253	44	9	1	10
255	48	3	4	7
263	38	5	1	6
270	37	4	4	8
275	53	5	3	8
276	43	1	2	3
287	42	5	5	10
293	41	7	1	8
308	46	2	2	4
315	42	4	6	10
322	48	0	8	8
330	58	4	1	5
337	52	7	2	9
339	46	4	4	8
347	41	5	5	10
TOTAL	2604	385	213	598

Basing our work on the results of our sample of closed files, we estimated the total number of closed files at the TPLS at 14,323 (352 boxes of 40.69 files on an average), and the number of closed files with respect to 1974 road accident victims at 3,288.

PROCEDURE FOR DATA COLLECTION

A) Data Collection Staff

Three persons worked on the data collection between the months of November 1976 and February 1977. One of them acted as data collection supervisor. This person was employed by the research team as a research assistant and was a doctorate student in demography. He took part in each of the development stages of the research project and was well acquainted with the data in the files intended for examination, as he had been responsible for making the pre-test.

His role was to train the staff (two persons), supervise their work to ensure standardization of the data collection, check each of the files in relation to the nature of the injuries, and monitor the relationship between Third Party Staff and the data collection staff.

The two other people were chosen through the intermediary of the Q.H.I.B. Our main selection criteria were: possession of medical knowledge and experience in data collection. We engaged the services of a medical archivist with about 8 years of experience and a laboratory technician whose concern for precision proved to be a valuable asset in data collection.

These two people were trained, and then, the first fifty files were reviewed and discussed by the three staff members of the collection team to ensure standardized data gathering.

B) DATA COLLECTION STAGES

A) Information sheet

The first stage consists of completing an information sheet (see Appendix I) for each of the 1,200 files making up the initial sample. This stage was to ensure that the file was actually that of a person injured in a road accident involving at least one motor vehicle during the year 1974. Moreover, the state of the file had to be assessed in terms of its content for research purposes. A note was made as to whether the file was complete or not. If the file was incomplete, a list was drawn up of the missing information and where it could be obtained: the Department of Transport (police report), the Department of Social Affairs (hospital report) or the Q.H.I.B. (case history of medical services).

Between 500 and 1 200 files from the initial sampling were completed and ready to be processed at this stage.

b) Incomplete files

The second stage consisted of finding the missing information in order to complete at least 500 to 700 incomplete files. This work was done by the data collection supervisor concurrently with the third stage of the collection. 500 to 700 incomplete files were completed and in this way the final sample of 1 000 files could be consolidated.

c) Data gathering

The third stage consisted of extracting from different information elements, the variables we considered essential for our study. A special form had been prepared to facilitate work on data collection (Appendix V, p. 227).

Generally, we started with the processing of the accident report, for a better reconstruction of the accident circumstances. Then, the hospital report was processed (there may have been more than one hospital report), as well as the case history of medical services. Finally, we consulted the questionnaire filled out by the victim or his family, in order to ensure that all the data was compatible.

The most delicate part of the collection dealt with the proper identification and severity AIS classification of injuries suffered by the victim because this required judgement based on established criteria. We tried to carry out this operation in the most objective way possible, but we were aware of the possibility of variations resulting from inter-observer reliability (a validity test of the data was carried out to measure these variations; these will be discussed in Part II Section 6 of the report). The main criterion that we tried to respect consisted of identifying the smallest injury unit. Each of the injuries sustained by the victim had to be defined as completely as possible and the general injuries had to be overlooked. For example, the injury "forearm multiple fractures" had to be neglected in favour of "fracture of the radius and ulna".

Cases that presented special problems with respect to the identification of injuries or the evaluation of the severity of injuries, were discussed by staff and were submitted to an orthopaedist acting as consultant to the research team.

d) Checking data collection

The last stage of the collection consisted of checking each of the forms that had been completed. This was done by the research workers supervisor of the data collection and took place at the actual site of the collection i.e. at the Q.H.I.B.

We had to be assured that all the variables had been extracted from the data and that the identification of injuries and the appreciation of their severity had been carried out in accordance with the norms laid down.

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